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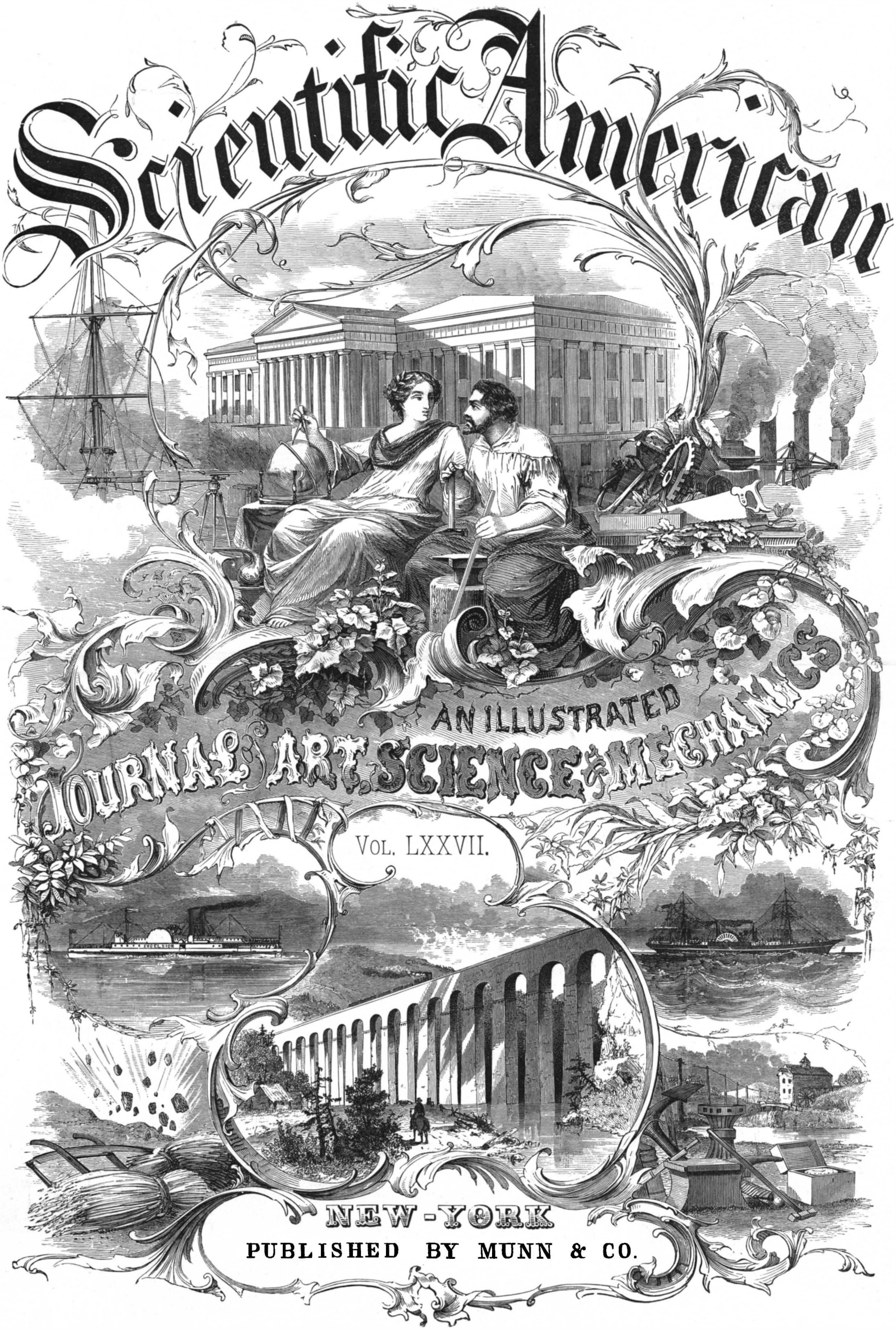

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VOL. LXXVII.

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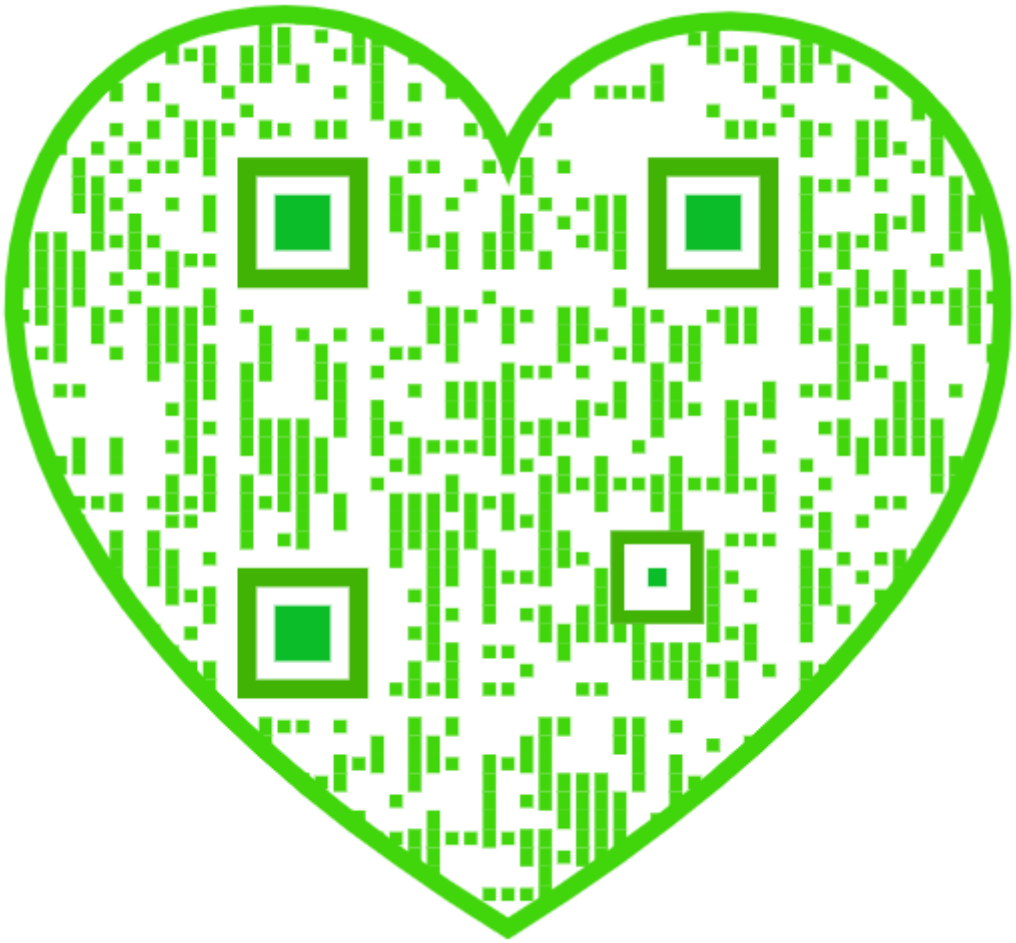

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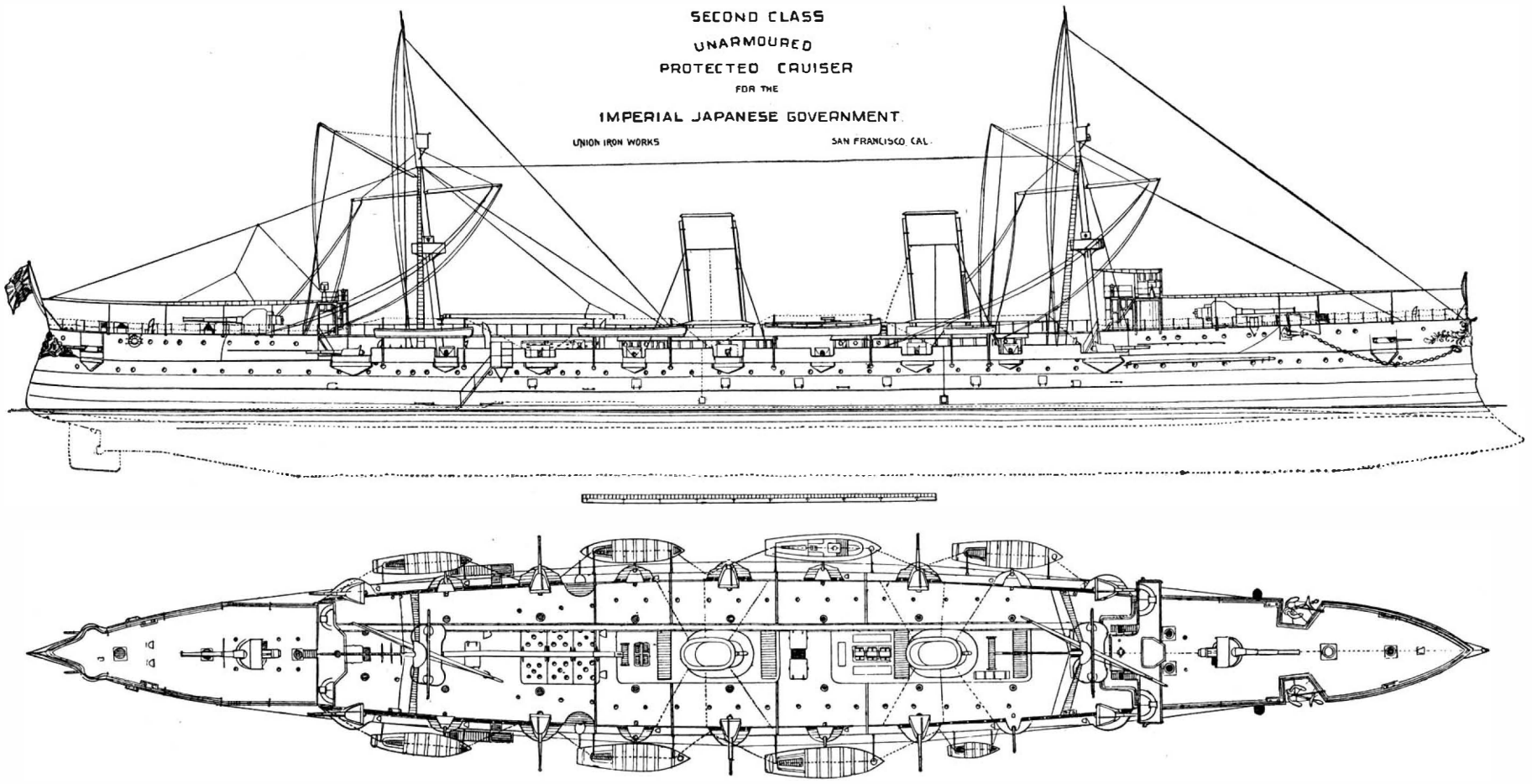
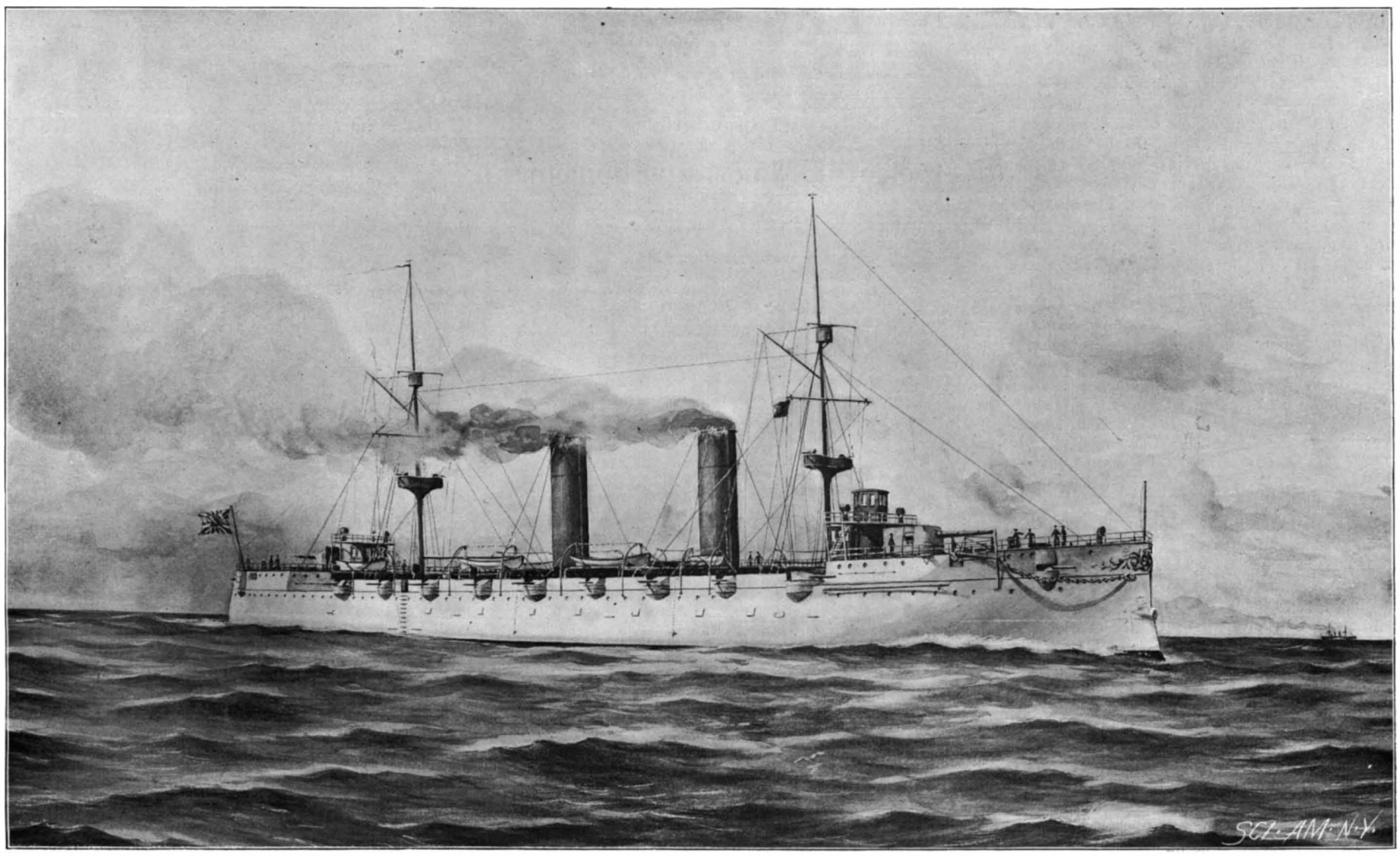
AMERICAN BUILT CRUISERS FOR JAPAN.

There is good reason to hope that the recent placing of orders for the construction of two foreign warships in American yards will prove the first step toward building up an extensive foreign business in this particular line. The unfortunate decadence of our merchant marine has left our shipbuilding yards with small prospects of securing many orders for ocean freight and passenger ships; but if we can only secure a reasonable share of the warship construction which is being done by England and France for foreign governments, it would keep our leading shipbuilding yards in steady employment, and the trade being once established, it would be certain to increase in volume.

The good work of the Union Iron Works, of San



SHEER AND DECK PLANS OF JAPANESE CRUISER BUILDING AT THE UNION IRON WORKS, SAN FRANCISCO.



JAPANESE UNARMORED CRUISER BUILDING IN AMERICAN YARDS.

Water line length, 396 feet; beam, 49 feet; draught, 17 feet 7 inches; displacement, 4,760 tons; speed, 22½ knots.

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Francisco—the leading shipbuilding plant on the Pacific coast—has borne fruit; and the firm is to build a craft for the imperial Japanese government in substantial token of the impression made in the East by the Charleston and the Olympia, the fabrications of that yard. An order for a duplicate vessel was placed at the same time with William Cramp & Sons, of Philadelphia.

The new vessel, designated by the Japanese as a second class, unarmored, protected cruiser, is unlike any vessel in our service; and is modeled after several swift cruisers of English build constructed for other nations, the best of which boats is the Japanese Yoshino, which took a very active part in the late Chino-Japanese war, and during her wide service proved herself an exceptionally effective craft.

The cruiser to be built by the Union Iron Works is an enlarged and bettered Yoshino; and it is no small credit to the Pacific yard that it is willing to trust its standing upon the development of lines peculiarly English and to start afresh where the patient practice of its rival has halted.

The new ship will have a load water line length of 396 feet; an extreme beam of 49 feet; and upon a normal displacement of 4,760 tons will draw 17 feet 7¼ inches of water.

There will be twin screws, each screw being driven by a triple expansion engine. These engines, which are in separate compartments, are of the four cylinder type; and each will have a high pressure cylinder of 40 inches, an intermediate pressure cylinder of 60 inches, and two low pressure cylinders of 66 inches in diameter. The common stroke is three feet, and when they work at their maximum power the engines will develop 15,000 indicated horse power, and will induce a speed of quite 22½ knots an hour. The probability is that this speed will be exceeded.

Steam will be supplied by four double-ended and four single-ended boilers, in four separate watertight compartments; and forced draught will be induced by large blowers exhausting directly into the closed fire rooms. The normal coal supply will be 350 tons, but the bunker capacity will be for 1,000 tons; and upon this liberal allowance the vessel will have an exceptionally wide radius of action. The coal will be stowed abreast the boilers and the engines for the sake of added protection; and to lessen the tax of handling, it will be arranged to fall right in upon the fire room floors.

There is a double bottom from stem to stern, and a cellular form of structure prevails along the water line region. This arrangement, in conjunction with the disposition of coal, and a protective deck, 4½ inches thick on the slopes and 1¾ inches thick on the flat portion, extending from bow to stern and generally about the level of the water line, offers excellent protection against high explosive shell fire, and guarantees shelter for the vitals and the preservation of stability.

The Japanese know only too well the danger of conflagration in action and its vital menace to efficiency, and with a view to protection, every bit of woodwork will be fireproofed. The ship will be lighted by electricity and ventilated by natural and artificial means; and comfortable and healthful accommodations are planned for the complement of 405 persons.

The armament will consist, in the main battery, of two 8 inch quick-firing rifles and ten 4·7 inch quick-firing rifles, and, in the secondary battery, of twelve 12 pounders and six 2½ pounders. The 8 inch guns are mounted one on the forecastle and one on the poop deck, and each will have an arc of fire of 270°. These guns are protected by steel shields, and, in their rapid-fire mechanisms, are beautiful evidences of skill. Each projectile weighs 210 pounds, and a speed of fire of four aimed shots in sixty-four seconds has been attained by a well trained crew. While our own 8 inch guns fire a shell of 250 pounds, our best practice has been one shot in a minute and a half. The 4·7 inch guns are mounted on the main deck, in 3 inch armored sponsons, and are further protected by shields. The forward and aft 4·7 inch guns fire dead ahead and dead astern, respectively, and have a total arc of fire, each, of 130°. The rest of these guns, in broadside, have a radius of fire of about 100°.

The 12 pounder guns are mounted on the main deck amidships and one at the bow and one at the stern, on each side, in sponsons. These guns likewise have effective arcs of fire. The 2½ pounders are carried on the hammock berthing and in the military tops.

The whole armament is capable of great rapidity of fire, and all the guns will be manufactured by the celebrated Armstrong firm, of Newcastle, England. The ammunition for the heavier guns is raised by electrical hoists, while that for the secondary battery will be raised by hand. There are five torpedo tubes, one in the stem and two on each broadside, for the discharge of 14 inch Whitehead torpedoes.

The new ship will have the characteristic handiness of maneuvering common to the Yoshino and her type, and will form, with her sister ship, a valuable addition to the new Japanese navy.

We are indebted to the Union Iron Works, of San Francisco, for plans and particulars.

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PROPOSED BRIDGE ACROSS THE ST. LAWRENCE AT QUEBEC.

We have received from Mr. Charles Baillairge a sketch of a design which was made by him some forty years ago, for a proposed trussed railway suspension bridge across the St. Lawrence River, opposite Quebec. Our correspondent points out that the question of a bridge of this kind at Quebec is by no means a new one, and that this design, which we now have before us, was submitted as being the best solution of the problem of conveying the railroad and highway traffic across the river. Attention is called to the fact that this sketch of over forty years ago embodies the best features of modern practice for long span railway bridges. The distance across the river, opposite Dufferin Terrace, from cliff to cliff, is 4,800 feet, and this was to be spanned by three 1,200 foot river spans and two 600 foot shore spans. The bridge was to have been built on the trussed suspension system and was to have a double deck, the lower deck being used for railroad traffic and the upper deck for highway and pedestrian traffic. The foundations were to have been carried down more than 150 feet below high water, the piers being built of solid first-class masonry up to the level of the lower floor or deck of the bridge.

The plan view shows an arrangement of five cables. The center cable was to hang in a vertical plane, the four outer cables being considerably "cradled." Mr. Baillairgé points out that this old design is quite applicable in its broad features to the conditions of modern bridge building, and that it would merely be necessary to make such changes in the details as would be called for by modern developments in the manufacture of steel and general bridge material. It is pointed out that the deep foundations could be constructed on the principle of the Hawkesbury River piers erected a few years ago in Australia by the Union Bridge Company, of New York, in which some of the piers were carried down through mud and sand to a depth of 180 feet.

THE NEW RULES OF PRACTICE OF THE PATENT OFFICE ABROGATED.

The revised rules of practice of the Patent Office, which were promulgated by the late Commissioner of Patents, were abrogated Saturday, June 19, by Secretary Bliss on the recommendation of Commissioner Butterworth, and the original rules of practice, which were in force April 1, 1892, have been reinstated. The original rules referred to numbered in all two hundred and twenty-nine, and they were condensed by the late Commissioner to eighty-eight.

In abrogating the revised rules of his predecessor, Mr. Butterworth has incorporated several amendments bearing upon the practice of the Patent Office. Of these, rule 17 reads as follows:

"An applicant or assignee of an entire interest may prosecute his own case, but he is advised, unless familiar with such matters, to employ a patent attorney, as the value of a patent depends largely upon the skillful preparation of the specification or claims.

"An applicant may be represented by

"(a) Any person who, at the date of approval of this rule, is in good standing as a practitioner before the Patent Office.

"(b) Any attorney-at-law in good standing in any court of record in the United States or in any of the States or Territories thereof.

"(c) Any person of good moral character who shall show to the satisfaction of the Commissioner of Patents that he is duly qualified to act as attorney in the prosecution of cases before the office."

THE FATIGUE OF METALS.

An investigation of the fracture of a steel rail on the Great Northern Railway, in England, has brought out some interesting facts bearing upon the question of the fatigue of metals. On the occasion in question a Bessemer steel rail, which had been in use for about twenty-two years, broke into nearly a score of pieces beneath the wheels of a Great Northern express train, causing a serious wreck. An examination was carried out by Mr. Thomas Andrews, M. Inst. C.E., and in a paper on microscopic observation on the deterioration by fatigue in steel rails, he gives some very interesting particulars regarding the appearance of the broken fragments of the rail. The composition of the rail was as follows: Carbon 0·53 per cent, silicon 0·12 per cent, phosphorus 0·08 per cent, sulphur 0·09 per cent. The microscopic examination revealed a large number of fine hair cracks, and Mr. Andrews concludes that the continual hammering of the wheels had developed these minute fractures throughout the body of the metal and produced the remarkable simultaneous failure which occurred at many points of the rail. The occurrence of such hair-like cracks in manufactured steel is not uncommon, and just what it is that causes them is an open question. It is possible they occur in the process of rolling, and that in the case of steel rails they are to be traced to this origin more than to the severe concussion of the traffic which passes over them. This supposition is borne out by the fact that such cracks are to be found in the newly finished output of the mills,

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and if they are to be prevented, the cure will have to be found in the process of manufacture. The fatigue of metal is a pretty theory, and one which was largely accepted a few years ago. To-day, however, it is believed that such fatigue does not take place, except, perhaps, in cases where the metal is subjected to very violent and long-continued strains.

MUNICIPAL GOVERNMENT WITHOUT TAXATION.

The city of Glasgow, Scotland, is in the fortunate position of being able to pay all the expenses of the city government out of the revenue derived from its public improvements—a state of things which has earned for this city the title to be called the most advanced and best governed city in the world. The details regarding the system employed by the municipal authorities are given in a letter from Mr. Joseph Asbury Johnson, in the Morning Call, of San Francisco, from which it appears that the progress of improvement of the city dates from the year 1854, when a number of philanthropic citizens formed an association for the improvement of the condition of the slum population. This was practically the beginning of a reform movement which ultimately resulted in an act of Parliament empowering the city corporation to carry out the work which philanthropy and private effort had failed to accomplish. It is claimed that at this time the condition of the poor in the city was worse than in any other of the cities of Great Britain. On June 11 occurred the thirty-first anniversary of the passage by the British Parliament of the Glasgow Improvement Trust Act. The measure has worked so well that to-day the slum districts are practically eradicated. The city condemned the wretched tenements and erected in their place the very best form of modern sanitary buildings, containing one, two, three, four, or five room apartments, which the city rents to the tenants at from $3 to $17 a month. The water and gas rates which are paid to the city are merely nominal and reduce the cost of living to a minimum. There are altogether over one thousand of these suites of rooms or flats owned by the city and rented at the prices named above, and at the average rate of six persons to the flat, there are over six thousand people accommodated in this way. The scheme has been so well managed that the income derived by the city not only covers the interest of the investment, cost of maintenance, and all incidental expenses, but there has actually accumulated a sinking fund which is gradually wiping out the debt incurred in the purchase of the condemned property and constructing the new tenements.

Encouraged by the success of this experiment, the city organized a system of relief and benefit for widows and widowers with small families who are obliged to go to their daily labor and have no one in whose care they can leave the children. A large building was erected, containing one hundred and seventy-five bedrooms and a number of nurseries, bathrooms, kitchens, and playrooms for the children, and a staff of nurses was engaged to look after the little ones during the entire day. The charges are extremely low, including as they do light, heat, washing and care of the children, etc. The prices paid are as follows: For a mother and child, 79 cents per week; a mother and two children, 95½ cents; with three children, $1, and 12½ cents for each additional child. For a father and one child, $1.04 a week; father with two children, $1.21 per week; with three children, $1.38 per week, with a charge of 16 cents extra for each additional child. In addition to this, board is provided for adults at 5 cents for breakfast, 8 cents for dinner, and 6 cents for supper, or 19 cents per day. Summing up these items, we find that a widow with three children can live very comfortably for $3.38 per week, and a man with three children for $3.75.

A further extension of the operations of this laudable system of government is now being carried out, by which the city will be given parliamentary power to expropriate property to provide sanitary dwellings for all the working classes. So excellent is the credit of the city that it is able to borrow all the money it needs at 2½ per cent, a rate of interest which will go far to make the venture a financial success; and it is reasonably expected that the social and sanitary results will fully compensate the city for the outlay. It may be mentioned here that many years ago the city established public wash houses where, for 4 cents an hour, a woman is allowed the use of hot and cold water wash-tubs, and may have the washed clothes machine-dried and mangled all within the hour. It is claimed that of all the vast number of operations of this kind undertaken by the city none has proved a failure, and what this means can be understood when it is said that the authorities have under their care city farms, city markets, dairies, libraries, scientific schools, and many other things of like character. Indeed, the city has realized in fifty different ways the reduction of the cost of service to the public which comes from the public ownership of lighting plants, street cars, waterworks, markets, and other public utilities. In conclusion it may be said that no clearer tribute to the success of the system can be paid than by the fact that the entire revenue of the city is derived from its public works and institutions, and that the hours of service of the public employes have been shortened and their daily wage increased.

SETTLEMENT OF THE VACANT PUBLIC LANDS OF THE UNITED STATES.

The settlement of the middle and far West of the United States presents the most striking example in history of the rapid subjugation of a virgin country by an enterprising race. The records of ancient or medieval times fail to show a single instance in which a people has taken possession of the land so swiftly and covered it as if by magic with the evidences of an up-to date civilization. Nor is it likely that such a development as that of the past thirty years will be repeated in any other quarter of the world. The great railroad which is under construction by the Russian government across Siberia is not likely to produce any such a transformation as followed the completion of our own transcontinental lines to the Pacific coast; and judging from what has already been accomplished in the civilization of Africa, it is likely that its development will be slow in comparison with that of our Western territories.

If we wish to trace the history of legislation on the subject of the disposal and settlement of public lands in the United States, we must go back to the earliest days of the republic. An ordinance was passed in 1787 which provided for the organization of the territory lying to the northwest of the Ohio, and declared that the new States should never interfere with the disposal of the soil by the United States. In an interesting article in the National Geographic Magazine, by Mr. Emory F. Best, assistant commissioner of the General Land Office, we are told that in all subsequent admissions of new States into the Union the absolute proprietary power and primary right of disposition of the soil has been uniformly reserved by solemn compact in conformity therewith. Cessions of territory to the United States were made upon the condition that the land should be held in trust for all the States, the original purpose being to create a fund for the redemption of the public debt.

The basis of the public land system is found in the plan submitted to Congress in 1790 by Mr. Hamilton, in which it was sought to raise revenue from the sale of the land. It provided for the disposal of the public domain at public offering, by private cash sales, and by the allowance of the preference right of purchase to actual settlers under the several pre-emption laws. These laws were at first temporary, being limited in their operation, until the general law of 1841, which continued in force until its repeal by the act of March 3, 1891.

The general policy of sales for revenue remained unchanged until the question of free homes for the people came to be agitated, and resulted in the homestead law of 1862. The homestead law provided that any citizen who is the head of a family, or who has arrived at the age of 21 years, may acquire title to 160 acres of land by residing upon, cultivating, and improving the tract for five years immediately preceding his final proof, free from all cost except the Land Office fees.

The homestead law was one of the most beneficent ever recorded in the statute books of a nation. Coming about the same time as the extensive grants of land in aid of the construction of the Pacific railroads, it proved to be a powerful factor in the building upon of the vast extent of country lying to the west of the Mississippi River. Thirty-five years ago the Indian roved over this country, much of which was known as the Great American Desert, and dwellers in the Eastern States only caught an occasional glimpse of its natural riches, when observant travelers returned with stories of its rich grass lands and endless ranges of forest-clad hills. How largely the settlers have availed themselves of the law is shown by the fact that up to the last fiscal year 508,936 homestead entries have been allowed, embracing an area of 67,618,451 acres.

Altogether, during the period under review, 247,000,000 acres have been sold for cash. In this total are included the homestead entries, which have realized about $280,000,000. This item, with the grants to railroads and donations to States for educational purposes and internal improvements, includes the greatest portion of the public lands already disposed of by the government.

There remains some 600,000,000 acres of vacant public land, exclusive of Alaska, of which 100,000,000 acres only are favored with sufficient rainfall for the successful cultivation of crops. The title to the soil is in the United States, but the control of the water rests with the State. Mr. Best is of the opinion that unless these two elements are combined, the land is valueless, and he asks the question: "Are the laws which have operated so favorably in the disposal of the well watered and fertile lands of the Mississippi Valley adequate to the conditions that confront us in the arid West?" The act of March 3, 1877, authorizing the entry of 640 acres of desert land upon the condition of paying $1.25 per acre and reclaiming the land by irrigation, which was designed to meet these conditions, has failed to yield any commensurate results of the kind intended; for while the lands lying along the borders of the streams, which are capable of easy irrigation, have been taken up, the arid lands proper, or those that cannot be reclaimed by the individual efforts of the settler, are still lying neglected.

It is estimated that of the 500,000,000 acres of vacant lands within the arid region only 20 per cent can be brought under cultivation, and that this can only be done by good engineering treatment of the problem, and a careful use of the water that is brought in. The special committee appointed by the United States Senate in 1889 to investigate this subject, says: "The irrigable lands are limited in extent. The area of the arid region which can be irrigated is a small fraction of the entire region. This arises from the fact that all the waters that can be used are insufficient to serve all the possible irrigable lands. It therefore becomes necessary to select the lands to be redeemed. On the wisdom of this selection vast interests depend. It is possible to irrigate lands on the mountains and on the high plateaus, but if the water is used there it cannot be used below, and these elevated lands will not make the best homes for the people. The climate there is rigorous, and the variety of agricultural products that can be raised is limited, being chiefly hay and vegetables. To use the water on such lands is largely to waste it, and to drive agriculture into the mountains is to doom the people engaged therein to a dreary life in a subarctic climate. It is therefore manifestly to the interest of the greatest number of people that the agriculture of the arid lands should not be established in the mountain regions. The valleys and plains below are warm, salubrious, and rich, the variety of agricultural products is great, and if the waters are used on these lands, they will give support to a prosperous people."

It is argued from the above report that the vacant public lands should not be disposed of until they have been brought into an agricultural condition by irrigation, and it is suggested that the best way to accomplish this result would be to let the States control the waters within their respective borders. The right to use the water being under the absolute control of the State, it would, if it also controlled the land, be in a position to secure, by a judicious choice of the land to be irrigated, an economical and profitable use of the water. At present 76 per cent of the arid land is in the hands of the government. In Nevada 95 per cent of the area is vacant, and these lands contribute nothing to the revenues of the State, and therefore it is impossible for the State to undertake a system of irrigation itself. It would surely be good policy for the government to dispose of them to the State, so that they may become an available source of revenue. It is true the Carey act of August 19, 1894, authorizes the Secretary of the Interior to contract with any of the desert land States to donate to the States such lands as the States may cause to be irrigated, reclaimed, occupied, and cultivated by actual settlers; but it fails to give the State sufficient control over the lands to enable it to pledge them as security for their reclamation, and hence it cannot contract for the construction of works on the most favorable terms. The assistant commissioner argues with much reason that if the Carey law were so amended as to provide for the granting of the lands to the State upon application, leaving the State free to contract for their reclamation and to pledge the lands as security therefor, it would be of practical benefit, and under its provisions the State might be enabled to secure the reclamation of all the lands within its limits that could be utilized.

INTERESTING MARINE STATISTICS.

The merchant marine of the United States on June 30, 1896, comprised 22,908 vessels of 4,703,880 gross tons—a decrease of 330 vessels, but an increase of 68,000 tons over the previous year. Wooden sailing vessels numbered 16,244, of 2,310,819 gross tons. Iron and steel steamers numbered 880, of 1,004,113 gross tons. Vessels documented at the Atlantic and Gulf ports numbered 16,786, of 2,667,313 gross tons; at Pacific coast ports, 1,560, of 437,972 tons; on the great lakes, 2,333, of 1,324,068 tons; and on the Western rivers, 1,229 vessels, of 274,527 tons. Vessels registered for the foreign trade numbered 1,257, of 844,954 tons, of which 244 are steamers. Vessels built and documented during the year number 723, of 227,096 gross tons, or more than double the construction of the previous year. On the great lakes 117 vessels, of 108,782 tons, were built.—Report of Bureau of Navigation.

DEATH OF PROF. FRESENIUS.

Prof. Carl Remigius Fresenius, the great chemist, died June 10, from a stroke of apoplexy. He was born in 1818, at Frankfort-on-the-Main, and was made professor of chemistry at the Institute of Wiesbaden. He founded a laboratory at Wiesbaden, which resulted in great developments, particularly of an industrial and agricultural nature. He was the author of several works on chemistry, the most famous being probably his "Qualitative Analysis" and his "Quantitative Analysis." These works have a world-wide reputation.

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AN IMPROVED BICYCLE BRAKE.

The illustration represents a bicycle brake of such construction that the brake may be applied by the rider throwing his weight rearward on the saddle, the dotted lines, as shown in Fig. 1, indicating the movement of the saddle and brake shoe as the brake is applied, while Fig. 2 shows the brake shoe and its attach-

BORGFELDT'S BICYCLE BRAKE.

ing devices partly in section. The improvement has been patented by Heinrich G. Borgfeldt, 850-852 Broadway, Brooklyn, N. Y. The brake shoe is attached to a block connected by a forked link and collar with the king post, and the upwardly extending brake rod is connected with the rear portion of a horizontal saddle support extended through a sleeve on the upper end of a connecting post engaging the king post. The saddle support is pivoted to have a limited rocking movement in the sleeve, and as the center of gravity is normally forward of the rocking point, there is no danger of the rider accidentally setting the brake, which is effected by throwing the weight rearward on the saddle. The saddle support has a series of holes rearward of its pivotal point, for the adjustment of the brake rod to give more or less throw to the shoe, and the lower portion of the rod has notches, as indicated in Fig. 2, to permit of the higher or lower adjustment of the brake shoe, the preferred adjustment being such as will cause the shoe to be applied to the wheel slightly above its axis, causing a wedge-like action between the tire and the shoe.

TESTS OF THE WEARING QUALITIES OF FLOORING MATERIALS.

At the suggestion of Mr. Frank Furness, the well known architect, of Philadelphia, an extremely valuable series of tests has been carried out to determine the relative durability of various flooring materials. The experiments were carried out on May 15, by Messrs. William Gray & Sons, who are the largest contractors for stone work in Philadelphia, and they were made under the careful supervision of Mr. William J. Gray, who has given his affidavit as to the accuracy of the results as herewith published.

The accompanying diagram, in which the results are drawn to scale, was furnished to this office by Mr. Furness, and it certainly forms a very valuable and reliable contribution, which will be welcomed by architects and builders in general.

In carrying out the tests the specimens were cemented to identical blocks of sandstone, each of which weighed twenty-one pounds. The samples presented a surface six inches square, and the thickness of each sample was the same as that commonly used in the various floorings. In the diagram the upper figures represent the specimens attached to the blocks before being tested, the thickness of the specimen being shown to scale. Thus the interlocking rubber tile specimen was ⅜ inch thick, the No. 1 Vermont marble was 1 inch thick, the Oregon pine 2¾ inches thick, and so on.

The samples were all placed face downward upon a horizontal iron rubbing wheel 10 feet in diameter, which was run for a space of one hour at a speed of 75 revolutions per minute. A suitable frame held the blocks loosely in place and prevented them from rotating with the wheel, care being taken to let the full weight of the blocks bear upon the wheel. The face of the wheel was freely supplied during the test with the best sharp rubbing sand and water.

The wear of the various flooring materials is shown in the lower line of diagrams, which represents the lower left hand corner of each specimen drawn on a half size scale. The diagonal shading shows the portion of the materials which remained intact, and the clear space beneath shows the amount that was worn away by the wheel.

The diagram is extremely valuable and we are informed by Mr. Furness that great care was taken to secure reliable results. It is full of surprises. By far the best showing was that made by the interlocking rubber tile, which only lost $\frac{1}{64}$ of an inch as the result of an hour's grinding. On the other hand, the marble mosaic collapsed altogether, the one inch strip being rubbed entirely away within fifteen minutes under a pressure of a little over half a pound to the square inch. The whole slab disappeared in thirty-five minutes under the same pressure.

Next to the rubber, the English earthen tile showed by far the best results, losing only ⅛ of an inch in thickness; and of the stones, the granolithic made the best showing, losing ⅜ of an inch, flagstone coming next, with $\frac{9}{16}$ of an inch wear. The marbles wore away very fast, No. 1 Vermont marble losing ¾ of an inch. Their average resistance, indeed, was not as high as that of the woods.

One of the most curious results is shown in the action of the woods, where teak lost nearly double as much as the softer white pine, the wear being respectively $\frac{13}{16}$ and $\frac{7}{16}$ of an inch. Yellow pine showed the same wear as white pine, and the oak specimen lost the same amount as its great rival Oregon pine, which was reduced by ⅝ of an inch.

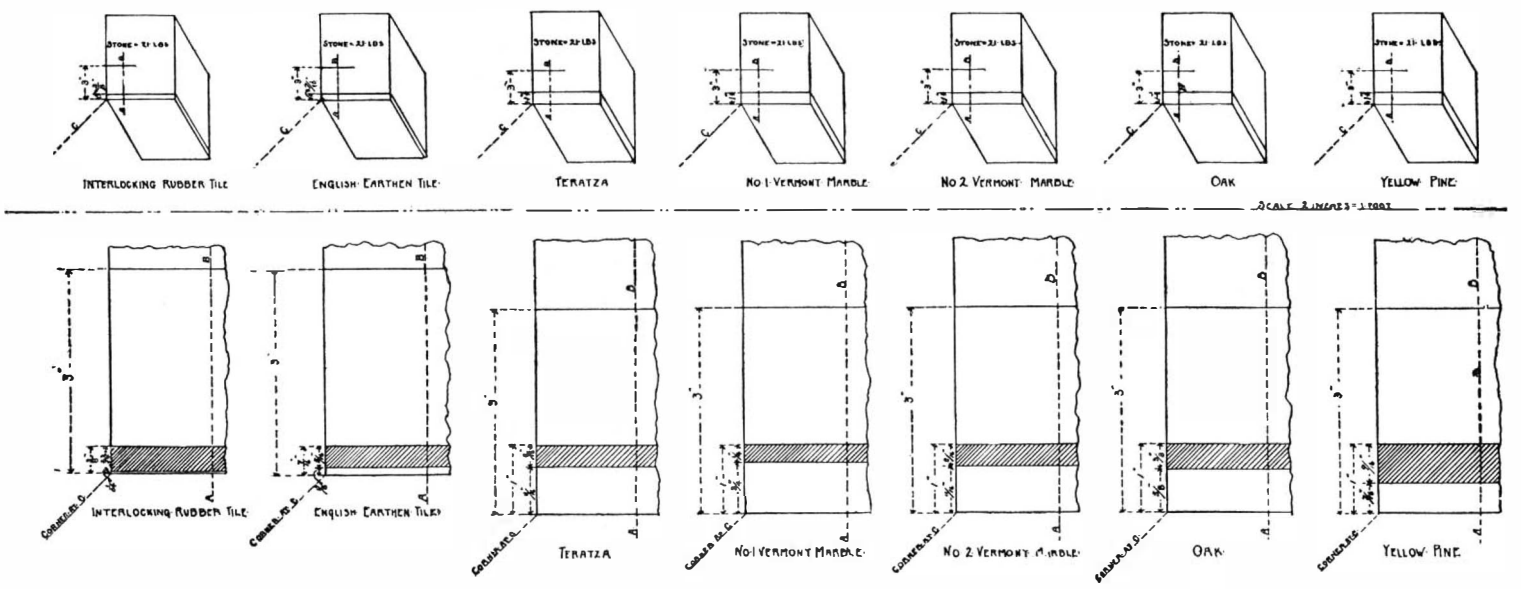
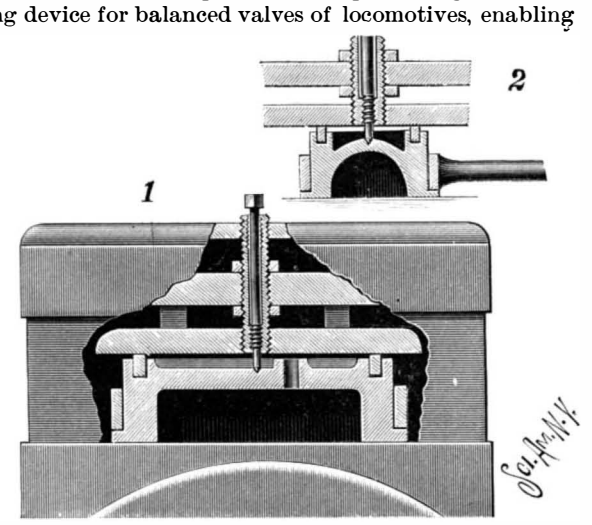


DIAGRAM SHOWING WEARING QUALITIES OF FLOORING MATERIALS.

A VALVE TESTING AND LOCKING DEVICE.

The illustration represents a simple testing and locking device for balanced valves of locomotives, enabling



SADLER'S VALVE TESTING AND LOCKING DEVICE.

the engineer to readily determine whether the valve on one or the other side of the engine is leaking without removing the outer plates or covers, and, when the engine is to be uncoupled on the road, to securely lock its balance valve. The improvement has been patented by James A. Sadler, Clarendon, Texas. Fig. 1 is a sectional view through the valve of a cylinder, the stop pin being in position, and Fig. 2 is a longitudinal section showing the stop pin in locking engagement with the valve. The valve casing is of the usual construction, and within it is the steam chest cover, the balance valve plate and the balance valve, the latter having in its top, at one side of the center, a release opening, and at a central point a V-shaped cavity. An exteriorly threaded sleeve is screwed into suitable openings in the steam chest cover and valve plate, the sleeve being interiorly threaded near its ends and being held in place by jam nuts. A test plug is normally screwed into the upper end of the sleeve, and by its removal the engineer may readily discover at what side of the engine any leakage occurs, as the leakage will pass up from beneath the balance valve through the release opening and thence out through the sleeve. To lock the valve, the reversing lever having been centrally placed and the valve centered, the test plug is removed and the stop pin screwed downward in the sleeve until its lower end firmly locks with the valve, as shown in both views. The sleeve will also be found useful for oiling the valve.

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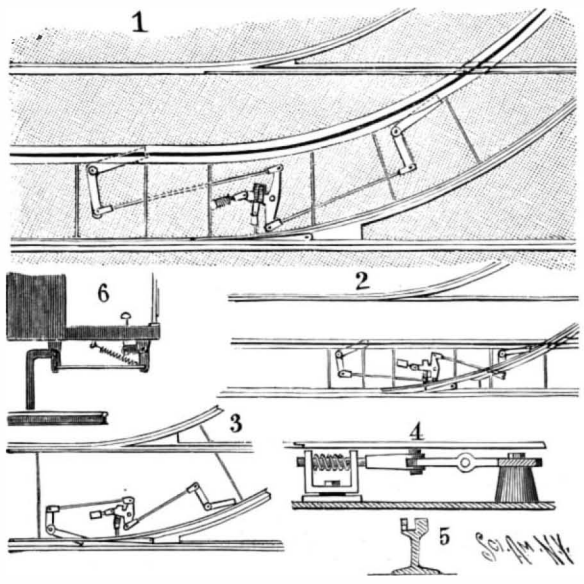
AN AUTOMATIC RAILWAY SWITCH.

A switch more especially designed for use on cable railways, but which may also be used in modified form with other street railways, is represented in the accompanying illustration, and has been patented by William Lickstrom, of No. 5 Manhattan Street, New York City. Figs. 1 and 2 are plan views of the switch



LICKSTROM'S AUTOMATIC RAILWAY SWITCH.

connecting a cable track and a track operated by horses or electricity, and Fig. 3 shows a modification adapted for use with railways of any kind, Fig. 4 representing a pivoted lever for throwing the switch and Fig. 5 a section of a special form of rail to be used, Fig. 6 showing one end of a car and its switch-operating lever. The switch point is connected by a link or rod to a bar movably retained by springs in a recess in a bell crank lever, from opposite arms of which extend rods connected at their other ends with bell crank levers pivoted close to one side of a cable conduit, the length of the rods being such that when an arm of one of the levers projects across the conduit slot the corresponding arm of the other lever lies alongside of the slot. In Fig. 1 the cable line is curved and in Fig. 2 it is straight, and a cable car coming to first the switch would be turned on the curve by the engagement of the grip with the lever arm extending across the conduit. As shown in Fig. 2, where the conditions are reversed, the car would be continued on the straight track. To hold the switch in either position to which it may be set, a rod or link connects one arm of the central bell crank lever to a pivoted guide rod under spring tension, as shown in Fig. 4, the spring resisting the throwing of the lever during the first part of its motion and assisting it during the latter part, thus acting to hold the switch in whatever position it may be placed. In the modified construction, for use with any kind of railway, a grooved guard rail is used, as shown in Fig. 5, the inner wall of the groove having a short longitudinal slot through which project the ends of the levers which in the other case extend over the conduit. The projecting ends of the levers are engaged and forced to one side by a lever extending down from the car platform, and thus made to move the switch point.

THE new mineral roeblingite is described by H. W. Foote and S. L. Penfield, in the American Journal of Science. It is a new silicate from Franklin Furnace, N. J. It is remarkable for containing sulphate dioxide and lead.

THE "WINGED VICTORY" FOR THE BATTLESHIP MASSACHUSETTS.

We present an illustration of the handsome emblematic figure in bronze, known as "Winged Victory," which is the gift of the State of Massachusetts to the battleship of the same name.

In some respects this handsome present is quite unique. In the case of all the other ships of the new navy, which have received gifts from the cities, towns or States after which they have been named, the event of their going into commission has been signalized by the presentation of handsome services of silver. One of the richest presentations of this kind was that made by the city of San Francisco to the cruiser of that name, when the ship was so overwhelmed with kindness that it has become a problem as to just where the silver shall be stowed—at least so says the New York Sun.

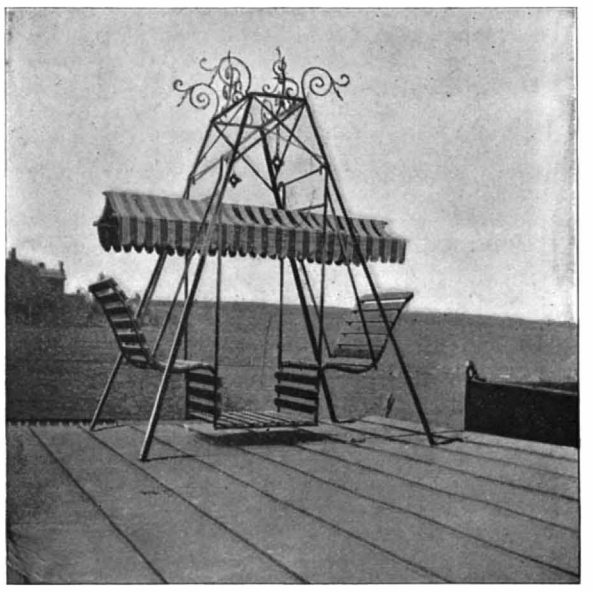
The gift of silver service made to the Brooklyn is valued at $10,000, and the other ships have received presents of approximately similar value. The Massachusetts Legislature, however, decided to depart from the time honored custom and present its namesake with an emblematic figure in bronze, accompanying the gift with a request that it should be placed in some prominent position on the battleship, and preferably on the forward turret.

The figure is life size and represents a very striking and spirited figure of a woman clad in a helmet and corselet; her wings spread abroad over the port holes of the turret, and with her arms pendent she holds a massive sword, upon which the single word "Victory" is engraved. The base of the figure contains the inscription "Gift of the Commonwealth of Massachusetts." Below this is engraved the motto "By duty done is honor won." The sculptor, Mr. Pratt, who is still a young man, was born in Norwich, Conn., in 1867. He passed through the Yale School of Fine Arts and afterward studied under Augustus St. Gaudens in New York and under Falguière in the Ecole des Beaux Arts, Paris. He designed two of the large groups in the peristyle at the World's Fair, and he has won the approbation of the critics by six seven-foot figures for the front entrance of the new Congressional Library at Washington, the large twelve-foot figure of Philosophy inside of the dome, and a series of massive bass reliefs of the same building.

BRONZE FIGURE "WINGED VICTORY" ON FORWARD TURRET OF BATTLESHIP MASSACHUSETTS.

AN IMPROVED SWING.

The illustration represents a double swing of perfected construction, all steel but the seats, having a large canopy top or adjustable awning, and with movable reclining seats which may be adjusted at any angle. It is one of several varieties of swings, embodying late improvements, manufactured by D. H. Bausman, of Bausman, Pa. The swing shown in the picture occupies a floor space of 7½ by 5½ feet, and is 10 feet high. These swings are painted in lemon and raw sienna tints, and are shipped in parts, adapted to be set up in a few minutes.



BAUSMAN'S STEEL SWING.

Insanity in Animals.

Insanity in the human subject is supposed by some to have no analogue in the lower animals, says Popular Science News. Yet many causes, according to Dr. Snelison, will lead to the permanent loss of self-control. Cattle driven from the country through a crowded town will often work themselves into a frenzy. Horses have gone mad on the battle field. At Balaklava an Arabian horse turned on its attendant as he was drawing water, seized him in his mouth, threw him down, and, kneeling on him, attacked him like an infuriated dog. He bit off another soldier's finger. An instance is related of a docile horse suddenly going mad on a hot day. Everything that came in its way it seized in its teeth and shook as a terrier does a rat. It raided the pigsties and threw the inmates one after another in the air, trampling on the bodies as they fell. Afterward it almost killed its own master, after maiming for life the farrier who was called in. This must have been a case of insanity, the cause of which is often to be found in congenital malformations of the bones of the head. A scientist of authority even goes so far as to prove by what appears to be incontestable evidence that cats, dogs, and monkeys have been observed to have delusions very similar to those of insane people.

A SPECIAL dispatch from Naples, dated June 4, says that Mount Vesuvius is in eruption. An area of 2,000 yards long by 500 wide is covered with lava, and it is dangerous to approach within 400 yards of the principal crater.

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The Liquefaction of Fluorine.*

The physical properties of a large number of mineral and organic fluorine compounds led to the theoretical prediction that the liquefaction of fluorine could only be accomplished at a very low temperature.

While the chlorides of boron and silicon are liquids at the ordinary temperature, the fluorides are gaseous, and well removed from their boiling points. The same difference is noticeable in their organic compounds, ethyl chloride boiling at 12°, ethyl fluoride at —32°, propyl chloride boiling at + 45°, ethyl fluoride at —2°.

Similar observations have been previously made by Paterno and Oliveri, and by Vallach and Heusler. These facts can also be connected with the experiments of Gladstone on atomic refraction. Finally, although clearly a member of the chlorine group, fluorine in some of its properties also presents some analogies to oxygen. The whole of these observations appear to clearly establish that fluorine would only with difficulty be reduced to a liquid, and it has already been shown by one of us that at —95°, under ordinary pressure, it does not change its state.

In the new experiments that we now publish the fluorine was prepared by the electrolysis of potassium fluoride in solution in anhydrous hydrofluoric acid. The fluorine gas was freed from the vapors of hydrofluoric acid by passing it through a small platinum spiral cooled by a mixture of solid carbon dioxide and alcohol. Two platinum tubes filled with well dried sodium fluoride completed this purification. The liquefaction apparatus consisted of a small cylinder of thin glass, to the upper part of which was joined a platinum tube. The latter contained another small tube of the same metal. The gas to be liquefied arrived by the annular space, passed into the glass bulb, and passed out again by the inside tube. This apparatus was united to the tube which led in the fluorine.

In these experiments we have used liquid oxygen as the refrigerating substance. This oxygen was prepared by the methods described by one of us, and these researches have necessitated the employment of several liters of this liquid. The apparatus being cooled to the temperature of quietly boiling oxygen (—183°), the current of fluorine gas passed into the glass bulb without liquefying; but at this low temperature the fluorine had lost its chemical activity, and no longer attacked glass.

If now the pressure on the boiling oxygen be reduced, it is seen, as soon as rapid ebullition is produced, that a liquid trickles down the walls of the glass bulb, while no gas issues from the apparatus. At this moment the exit tube is closed with the finger to prevent the entrance of any air. Before long the glass bulb becomes filled with clear yellow liquid possessing great mobility. The color of this liquid recalls the tint of fluorine seen through a layer a meter thick. According to this experiment, fluorine becomes a liquid at about —185°. As soon as the little condensation apparatus is removed from the liquid oxygen, the temperature rises and the yellow liquid begins to boil, furnishing an abundant evolution of a gas which presents all the energetic reactions of fluorine.

We have taken advantage of these experiments to study some of the reactions of fluorine upon bodies maintained at very low temperatures. Silicon, boron, carbon, sulphur, phosphorus, and reduced iron, cooled in liquid oxygen, and then projected into an atmosphere of fluorine, do not become incandescent. At this low temperature, fluorine does not displace iodine from iodides. Its chemical energy, however, is still sufficiently great to decompose turpentine or benzine with production of flame even at —180°. It would seem that the powerful affinity of the fluorine for hydrogen is the last to disappear.

Finally, there is one other experiment that we ought to mention. When a current of fluorine gas is passed into liquid oxygen, there is rapidly produced a white flocculent deposit, which soon settles at the bottom of the vessel. If the mixture is shaken and poured on a filter, this precipitate is separated. It possesses the curious property of deflagrating violently as soon as the temperature rises. We are pursuing the study of this compound, as well as that of the liquefaction and solidification of fluorine, in which further experiments are required.

* "On the Liquefaction of Fluorine," by H. Moissan and J. Dewar. Translated by Nature from Comptes Rendus of the Paris Academy of Sciences.

Have Bacteria Uses?

So much has been said about bacteria as causing and propagating disease that it is difficult to make the public regard these minute organisms as anything but mischief makers. Nevertheless, an American scientist, Prof. Conn, of Wesleyan University, and Simon C. Keith, of Boston, are demonstrating by experiments that they serve a useful purpose in nature, and contribute quite as much to one's pleasure as to one's discomfort. The outcome of their investigations, as stated in the New York Herald, is that it is to the development of bacteria in milk that the delicate flavor of butter and cheese is due, and that the reason some kinds of butter and cheese have better flavors than others is that different species of bacteria have been developed. They have succeeded in isolating these different species.

In 1891 Prof. Vilhelm Storch, of Copenhagen, succeeded in isolating certain acid bacteria from ripened cream, and was able to cultivate and utilize them in the creameries for accomplishing an artificial ripening in the cream and consequent fermentation, in order that a more uniform and better flavored butter might be produced. But it was not until two years ago, when Prof. Conn discovered a germ for the ripening of cream which was radically different from any heretofore used, that the subject began to be studied in this country with the view of developing its commercial possibilities. Since then a laboratory has been fitted up in Boston by Orrin Douglass for the separation, cultivation and investigation of bacteria from a commercial standpoint. Mr. Douglass has associated with him Mr. Keith, who is a graduate of the Institute of Technology.

The Fastest Steam Yacht Afloat.

The steam yacht Ellide, in the course of her second speed trial over a measured course, has made a new record for the mile, doing the distance in one minute and thirty-eight seconds. This is at the rate of thirty-six and a half miles an hour, or within a mile and a quarter of the speed attained by the torpedo boat Turbinia on her famous trial.

This result in a boat only eighty feet long has been attained by a special design of hull, engines and boilers. The hull is of composite construction, the frames and scantling being of steel and the skin consisting of two thicknesses of mahogany. She is divided into watertight compartments by five steel bulkheads, and stability is further assured by providing a number of copper air tanks.

The boiler is of a special type water tube designed by Mr. Mosher for high speed vessels, and combines a large steam raising capacity with a minimum of weight. Special attention is paid to the draught and to the circulation of the water. The arrangements for the former are such that the gases pass through the length of the boiler twice before entering the uptake. The boiler is arranged in two sections, with a view to enabling one of them to be used if the other should be disabled by the bursting of a tube or other mishap.

If we except the engines which have been put into some of the recent airships, the engines of the Ellide are probably the lightest for their horse power that have ever been built. They are quadruple expansion, the cylinders being 9 inches, 13 inches, 18 inches, and 24 inches in diameter by 10 inches stroke. On the trial in question, with a boiler pressure of 250 pounds to the square inch, they ran at 650 revolutions a minute.

In the official trial which is shortly to be made the Ellide will be lightened by about 3,000 pounds of weight in the shape of the twenty guests which were on board at the time of the last trial. Her engines will also have worn down to a smoother bearing and it is quite possible that the 37¾ miles an hour record of the Turbinia will be broken. Below is a list of the fastest yachts and torpedo boats in the world:

Name.	Description.	Miles an hour.
Turbinia* (English)	Torpedo boat	37¾
Ellide (American)	Yacht	36½
Star (English)	Torpedo boat	36
Porter (American)	"	34
Feiseen (American)	Yacht	31 6 10
Norwood (American)	"	30
Yankee Doodle (American)	"	29 6-10
Vamoose (American)	"	25

*Driven by triple compound steam turbine.

Building Roads Too Fast.

The Canadian Magazine raises the question whether Canada has not gone too far in giving aid to railroad building. It appears that on June 30, last year, there were 16,091 miles of track laid in Canada, and the Dominion government has contributed to this building at the rate of $9,369 per mile constructed, the Provincial government at the rate of $1,847, and the municipalities at the rate of $881 per mile. That is, for the net result of 16,091 miles, Canada has contributed, in round numbers, the very liberal sum of $195,000,000. In Cape Colony the proportion of net revenue to capital cost of railways is 5·75 per cent; in India, 4·96; in South Australia, 3·13; in New South Wales, 3·46; in New Zealand, 2·73; in Queensland, 2·13; and in Canada, 1·57. In only one British colony is the proportion lower than in Canada, and that is Tasmania. The Magazine thinks that this seems to indicate that Canada is building railroads too fast. It further quotes the Dominion statistician as saying: "The cost of a railway, it has been said, should not be more than ten times its annual traffic—that is, that the annual traffic should be ten per cent of its capital cost. If this standard is applied to Canadian railways, their cost will be found to very far exceed the limit." In 1895 the gross receipts of the Canadian railroads amounted to only $46,785,487, while the paid-up capital was $894,660,559, the percentage of traffic to cost being about five and one-quarter per cent instead of ten per cent.

Recent Patent and Trade Mark Decisions.

Ex parte Messinger (Commissioner's Decision), 78 O. G., 1903.

Time Within Which Reissues Should be Applied For.—Application for the reissue of a patent must be filed within two years or it will be considered abandoned under U. S. Rev. Stat., Sec. 4894.

Ex parte Musgrave & Nye (Commissioner's Decision), 78 O. G., 2046.

Non-patentability of a Process.—A process which employs low heat for a long time is not patentable over another which uses a high heat for a short time when the result is the same in both cases. Here the result was the partial distillation of coal. Therefore, the alleged invention of N. W. Musgrave and H. P. Nye has been held to be not patentable.

Wurts v. Herrington (Commissioner's Decision), 79 O. G., 335.

Proof of Reduction to Practice.—When complete reduction to practice amounts to two years' practical use, the effect of such reduction to practice must be established by evidence of the same degree as that required to establish two years' practical use. The fact that one device was operated only for a short time and then laid aside and not used until others began making and advertising the device raises the presumption that such former alleged use was experimental and that it amounted to nothing more than an abandoned experiment. The fact that the device was exhibited in a room ordinarily used to exhibit complete devices ready for the market is not proof in itself that such device was complete and on sale.

Wurts v. Herrington (Ct. of Ap., D. C.), 79 O. G., 337.

Reduction to Practice.—Reduction to practice by the junior party before the senior party does not require more than a preponderance of evidence. Certainly the evidence need not be so strong as to establish it beyond a reasonable doubt. But where a patent has been regularly issued, a strict rule as to the proof required to overcome the patent should prevail, at least where the evidence is suspicious.

Shelleberger v. Schnabel (Ct. of Ap., D. C.), 79 O. G., 339.

Dissolution of Interference.—When the commissioner in an interference case decides that there is no patentable invention in issue, the interference is thereby dissolved, for there cannot be an interference for a non-patentable thing.

Arnold v. Tyler (Ct. of Ap., D. C.), 79 O. G., 156.

Presumption as to Priority on Appeal.—The decision of the Patent Office as to the priority of invention must stand, unless the evidence shows beyond any reasonable doubt that the appellant was the true inventor.

Advice of Attorney.—The mistaken advice of an attorney, whereby longer delay resulted in the reduction to practice, is immaterial as against those who have been diligent.

Bruel v. Smith (Ct. of Ap., D. C.), 78 O. G., 1906.

Consistency of the Patent Office.—The Patent Office must be consistent and should not give so liberal construction to the terms of the issue as to enable it to include a structure which had previously been held to be patentably distinct therefrom. A device which differs from the terms of the issue in the particular feature which the office held once to have been sufficient to constitute a patentable distinction does not amount to a reduction to practice of the issue.

Duff Manufacturing Company v. Forgie (U. S. C. C., Pa.), 78 Fed., 626.

Infringement of Jacking Apparatus.—The Barrett patent, No. 455,993, for "lifting jacks" adapted to produce also horizontal motion, such improvement being based on the principle of a yielding, as distinguished from a rigid plate, has been construed and held infringed as to claims 1 and 6 by a jacking apparatus designed to produce horizontal circular motion to unscrew oil well tools, for, while they differ in form, the principle, design and functional purposes are substantially the same.

Clinton Wire Cloth Company v. Hendrick Manufacturing Company (U. S. C. C., Pa.), 78 Fed. Rep., 632.

Coal Screens.—The Philipps patent, No. 500,508, for revoluble coal screens providing the woven wire segments with protector plates connecting them together and covering their joints, the plates having inward extending projections to form tumblers, has been held void on the ground of showing mere mechanical skill.

Travers v. Hammock and Fly Net Company (U. S. C. C., Wis.), 78 Fed. Rep., 638.

Mechanical Process for Making Hammocks.—The Rood patent, No. 296,460, which describes a method of forming the ends of hammocks by drawing a cord straight through the end loops of the hammock body to form the converging strands which are gathered in a suspended loop or eye, has been held to cover a mere mechanical operation and, therefore, to be not a patentable process and void on its face.

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Correspondence.

Expansion of Rails in Hot Weather.

To the Editor of the SCIENTIFIC AMERICAN:

Before the art of laying railroad iron was brought to its present state of perfection, the main line of the Chicago, Burlington & Quincy Railroad west of Burlington, Iowa, was the scene of a most peculiar accident, due entirely to natural causes.

In 1868, that portion of the road described had never been ballasted, the wooden ties having been merely laid upon the loose dirt of the prairie, and not much trouble had been taken to tamp them. The rails had been laid upon these ties with their ends brought close up together.

James Roberts, a trusted engineer on the above road, left Burlington at eleven o'clock on a hot day in August, 1868, a little late. The train was scheduled fast for those days, but he made up the time before he reached Fairfield, Iowa. As the train was speeding west, three miles from Fairfield, Engineer Roberts was amazed to see the track about a mile ahead of him suddenly rise from the roadbed, writhe and bend like a wounded snake, and then slowly settle down into a perfect curve at the side of the roadbed upon the level prairie. He reversed his engine and whistled for brakes and brought the train to a standstill. Crew and passengers went forward and inspected the phenomenon. Not one tie had broken loose from the rails, and the new position of the track at the side of the roadbed seemed secure and safe. At least a mile of track had changed its position, and, after examining the track for the entire distance, it was decided to go on, and the train, moving slowly, passed safely over. The circumstance was reported, and the engineers visited the scene without delay. They reported the occurrence to be due to expansion of the rails, which, having been placed with their ends touching each other, allowed no room for expansion. The weather being so hot, the expansion became a force greater than the weight or gravity of the rails and ties, and lifted them bodily until the longitudinal pressure was removed, when the whole structure settled to one side in the form of a curve. The greater length of the curve was identical with the length of the expansion.

This is the only instance of the kind ever reported, but they would be of frequent occurrence were not the matter of the expansion of the rails taken into account when rails are laid, and a suitable space left between the ends of the rails to accommodate their increased length in very hot weather. C. M. GINTHER.

Hagerstown, Ind.

[In stating that the above remarkable case is the only instance of the kind ever reported, we presume that our correspondent refers to the fact that the track lifted bodily from the roadbed before settling into a curve, and that the actual change of position occurred before a reliable eye witness. "Kinks" in a roadbed are not an uncommon occurrence on the unballasted roads of the western prairies, though the translation from a tangent to a curve usually occurs by the ties and rails being pushed bodily sideways over the ground. The remarkable feature in the occurrence above mentioned was the sudden rise of the track, when one would have expected it to be gradual. In all probability there was a slight vertical curve in the track at this point. The initial expansion would be accommodated by the elasticity of the rails; but as soon as the vertical component of the thrust of the rails exceeded the combined weight of ties and rail, the latter would commence to rise with an accelerated movement due to the enormous elastic thrust of the metal.—ED.]

The Heavens for July.

BY WILLIAM R. BROOKS, M.A., F.R.A.S.

THE SUN.

The sun's right ascension on July 1 is 6 h. 43 m. 43 s.; and its declination north 23 deg. 4 m. 24 s.

On July 31, the sun's right ascension is 8 h. 44 m. 27 s.; and its declination north, 18 deg. 6 m. 6 s.

On July 1, at 9 h., the sun is at its greatest distance from the earth.

On July 29 will occur an annular eclipse of the sun, visible throughout the United States as a partial eclipse, beginning, for Washington, at 8 h. 42 m., and ending at 11 h. 2 m. A. M. At Washington the greatest obscuration will be 7 digits. To all places north it will be less, and to places south the obscuration will be greater. The path of annulus, about 25 miles in width, extends from a point in the Pacific Ocean 20 deg. west of the west coast of Mexico, passes across Mexico, the northern edge of Cuba, just touches the northeastern point of South America, and ends in the mid-Atlantic Ocean, in 21 deg. south latitude.

MERCURY.

Mercury is morning star the first half of the month. It comes into superior conjunction with the sun on July 15, when it changes to evening star.

On July 4, at 12 h., Mercury is at its ascending node, on July 9 at perihelion, and on the 19th at its greatest heliocentric latitude north.

Mercury is in conjunction with the moon on July 30, at 7 h. 38 m., when the planet will be 3 deg. 18 m. north of the moon.

The right ascension of Mercury on the first of the month is 5 h. 42 m. 59 s.; and its declination north, 22 deg. 53 m. 38 s.

On the last of the month its right ascension is 9 h. 49 m. 57 s.; and its declination north, 14 deg. 35 m. 49 s.

VENUS.

Venus is morning star, and a most beautiful object it is, as it heralds the approaching dawn. Venus reaches its greatest elongation west of the sun, 45 deg. 44 m., on July 7, at 11 h.

On July 17, at 4 h., Venus is at its greatest heliocentric latitude south.

On the 25th, at 2 h. 24 m., Venus will be in conjunction with the moon, when the planet will be 6 deg. 44 m. south of the moon.

On July 28, at 4 h., Venus will be in conjunction with Neptune, when Venus will be 1 deg. 21 m. south of Neptune.

On July 1, Venus rises at 1 h. 57 m. A. M., and crosses the meridian at 8 h. 52 m. A. M. On the last day of the month Venus rises at 1 h. 40 m., and crosses the meridian at 8 h. 59 m. A. M.

On July 15, the right ascension of Venus is 4 h. 30 m. 31 s., and its declination north 18 deg. 38 m. 51 s.

MARS.

Mars is evening star. In its rapid orbital motion among the stars it will be seen to overtake Regulus on July 5, when it will be within one degree of that well known star. Compare the ruddy light of the planet with the light of the star.

On July 25, at 10 h. A. M., Mars will be in conjunction with Jupiter, when Mars will be only seven minutes of arc south of Jupiter. This close approach may not be seen, but the planets will be found very near to each other on the evenings preceding and following the time of conjunction, forming an interesting celestial picture.

On July 3, at 8 h. 31 m., Mars is in conjunction with the moon, when the planet will be 3 deg. 21 m. north of the moon.

On July 1, Mars crosses the meridian at 3 h. 14 m., and sets at 10 h. 3 m. P. M. On July 31 Mars crosses the meridian at 2 h. 25 m. and sets at 8 h. 50 m. P. M. The right ascension of Mars on July 15 is 10 h. 25 m. 49 s.; and its declination north 10 deg. 56 m. 54 s.

JUPITER.

Jupiter is evening star, and is a very beautiful object in the western heavens soon after sunset. Telescopic work should be made at an early hour, while the planet is at a fair altitude.

Some of the phenomena of the satellites which occur at a sufficiently early hour for observation are here given.

On July 5, at 9 h. 22 m., the ingress of satellite I in transit will occur. On July 12, at 8 h. 14 m., satellite II will disappear by occultation. At 8 h. 57 m. satellite III will reappear from an eclipse.

On July 13, at 8 h. 35 m., satellite I will disappear by occultation. On July 14, at 8 h. 10 m., satellite I will egress from transit; and at 9 h. 4 m. the shadow of satellite I will pass off the disk of Jupiter.

On July 21, at 8 h. 28 m., satellite II will pass off the disk, and at 8 h. 41 m. the shadow of satellite I will enter in transit. On July 4, at 2 h. 24 m., there will be a conjunction of Jupiter and the moon, when the planet will be 4 deg. 10 m. north of the moon.

On the first of the month Jupiter crosses the meridian at 3 h. 53 m. and sets at 10 h. 28 m. P. M. On the last of the month Jupiter crosses the meridian at 2 h. 15 m., and sets at 8 h. 43 m. P. M.

The right ascension of Jupiter on the fifteenth of the month is 10 h. 42 m. 6 s.; and its declination north 9 deg. 23 m. 9 s.

SATURN.

Saturn is also evening star, and a very beautiful object in the southern heavens. Its wonderful ring system is quite widely opened out. The separation of the two bright rings may be well observed now with telescopes of very moderate aperture, under good atmospheric conditions.

On July 10, at 4 h. 10 m. A. M., Saturn is in conjunction with the moon, when the planet will be 7 deg. 18 m. north of the moon.

On July 28 Saturn is apparently stationary.

On the first of the month Saturn crosses the meridian at 8 h. 50 m. P. M., and sets at 1 h. 54 m. after midnight.

On the last of the month Saturn crosses the meridian at 6 h. 50 m. P. M. and sets at 11 h. 50 m. P. M.

The right ascension of Saturn on the fifteenth of the month is 15 h. 29 m. 39 s.; and its declination south 16 deg. 47 m. 12 s.

URANUS AND NEPTUNE.

Uranus is also in the southern evening heavens, about two degrees south of Saturn; its right ascension for the middle of the month being 15 h. 31 m. 18 s.; and its declination south 18 deg. 50 m. 46 s.

Neptune is in the morning sky, but too near the sun for observation.

Smith Observatory, Geneva, N. Y., June 21, 1897.

Science Notes.

Arrangements have been perfected for the establishment of zoological gardens in San Francisco.

It is said that an establishment for the manufacture of calcium carbide will be established at the new hydraulic power plant at Rhinefelden, Switzerland.

A fulgurite has been found in Rome, N. Y., which extends to a vertical height of forty-five feet. A fulgurite is a vitrified tube caused by lightning striking sand.

The International Submarine Telegraph Memorial Committee has granted "the Sir John Pender gold medal" to the Glasgow and West of Scotland Technical College. It is given annually to the best student, who at the same time obtains the college diploma in electrical engineering.

Natural Science has completed its tenth volume and will be hereafter published by J. M. Dent & Company, of London, It is remarkably well conducted and shows conclusively that science need not be dull. American science has been given more attention than in any other foreign journal. If for no other reason, it should have a good circulation in the United States.

In a recent number of the Comptes Rendus M. De Wateville gives a method of obtaining large and transparent crystals. The small crystal is so mounted that, while in a saturated solution, it can be continuously rotated on itself with a speed of several rotations a second. Potassium and ammonium alums, copper sulphide and sodium chlorate are said to give particularly fine results.

Until lately M. Moissan had not succeeded in preparing metallic titanium by pyro-electric reduction. He always obtained as the result of his experiments a hard, reddish-brown nitride of the metal, TiN_2. But recently he found that totally different results were obtained if a stronger current, and therefore a higher temperature, was used. By this method Moissan reduced titanium oxide in a mixture with carbon to a bead of metallic titanium surrounded by a coat of oxide. The metal contained about 2 to 6 per cent of carbon.—Uhland's Wochenschrift.

The Grand Duke of Bavaria had, in 1893, detected the monogram of Albrecht Dürer and the date 1521 on a painting in the possession of Mr. F. Bürger, in Munich. Still many doubted the authenticity of the picture. The painting was lately examined by means of X rays. On the screen appeared, to the surprise of the Brothers Haller, at whose laboratory the experiment was conducted, and of all others present, a perfectly clear image of Christ in a crown of thorns, and also the monogram of Dürer and the date were clearly visible.—Electrotechnische Rundschau.

A remarkable glacier eruption occurred during the early part of the present year in the south of Iceland. A postman was crossing the sands of Sakeitara when he heard sounds proceeding from a glacier two miles in front of him and saw large masses of ice being hurled up into the air from the glacier. This was followed by a flood which began descending to the sands below. He promptly fled, and when he returned, about a week later, he saw a belt of ice waves extending from the glacier to the sea, a distance of at least twenty-five miles. The average breadth of this belt was about four miles. The height varied from seventy to ninety feet. On the other side of the ice field were newly formed torrents which sprang from the glaciers. No one was injured by the glacier eruption, which, it is thought, may have some connection with the severe earthquakes of last summer.

Edward McIlhenny has sailed from San Francisco for two years' scientific work in the northeastern part of Alaska and the basin of the Mackenzie River. He was the ornithologist on the Cook excursion, which was wrecked in Davis Straits. He has associated with him W. L. Snyder, of Beaver Dam, Wis.; Norman G. Buxton, of Johnstown, Pa. They will take supplies for two years' work in the Arctic regions, most of their food being in condensed form and adapted for transportation in sledges. Point Barrow will be made the headquarters and expeditions will be made from it to northeastern Alaska, which is comparatively unknown. The fauna and flora of the Alaska and Mackenzie regions will be carefully studied and specimens sent back to the coast, from which they will be shipped to the National Museum, at Washington, and to the museum of the University of Pennsylvania. Mr. McIlhenny hopes to make a careful exploration of the Romanzoff Mountains, in Alaska, which are said to be rich in fossil remains.

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PARSEVAL'S KITE BALLOON.

The usual form of balloon adopted by all the leading armies of to-day is the pear-shaped, captive balloon, connected to earth by means of a steel rope. Now, while this shape is suitable enough for a freely traveling balloon, there are great drawbacks in its use for military purposes. In such cases what is required is steadiness in spite of the fixing rope and of the ordinary power of wind. It is found that a wind of ten meters per second is sufficient to make the ordinary pear-shaped balloon absolutely useless as a captive balloon. Now such a wind blows about one day out of three, so that the practical value of the aeronautic department of the army is greatly diminished. Still, so much importance remains attached to it, on account of its invaluable aid under favorable circumstances, that, in spite of all difficulties, balloons are always carried into maneuvers and into war.

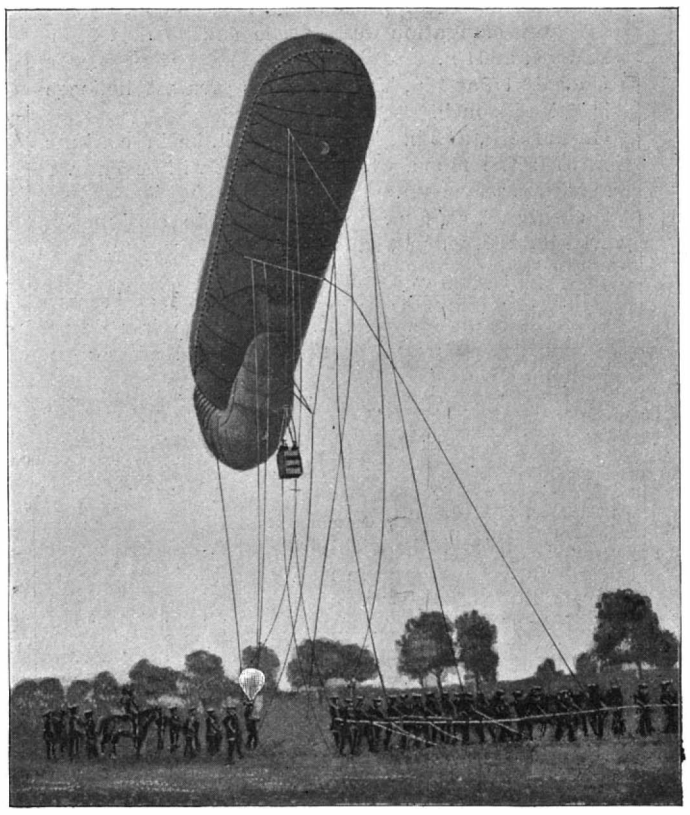
As alluded to before, the great difficulty hitherto was that the balloon is pressed down to earth by the wind, the rope assuming a position inclined at an angle to the ground, and permitting such extravagant motions and lurches as to make all observation impossible.

A new form of gas reservoir has, however, been devised by the German Captain Parseval, which overcomes the difficulties explained above, while it enables its occupants to use to a full extent and under all circumstances the excellent opportunities that an ordinary balloon offers only in a dead calm. The principle on which the new balloon is built is the well-known action of a kite. Its shape is that of a cylinder with hemispherical ends. The volume of the reservoir is about 600 cubic meters. The car is attached to the back, and the rope to the front end. When the balloon is filled the front end rises under the upthrust exerted by the atmosphere, and the whole assumes such a position that its axis is inclined about 50 deg. to the horizontal, and is in a plane parallel to the direction of the wind. Consequently the wind strikes the lower surface and acts as it does on an ordinary kite. But, as simple as the principle of the thing looks, in practice the inventor found many difficulties of important and by no means trifling character which could not have been foreseen, and which experiment alone revealed. It was, for instance, found on trial that the wind crushed the balloon, curving its back into an undesirable shape, so that the tension there was considerably greater than below. To avoid this distortion an ingenious contrivance was added to the main body of the reservoir. On the lower surface the constructor attached another reservoir with funnel-shaped mouth; this catches the wind, and the air collected keeps the shape of the balloon constant by its counterpressure.

The mixing of the air thus admitted with the gas is avoided by placing a loose partition of plaited fabric between the two. The pressure required to keep the balloon in shape is thus automatically provided; for the stronger the wind, the greater the tendency to curve, but the greater also the pressure in the wind reservoir. Moreover, another danger seemed imminent. In strong wind the balloon tossed a great deal, and there was even some fear of its capsizing. The solution of this difficulty was not an easy matter. It was found in the form of an air cushion, a sort of bag, attached to the back end of the lower surface, and serving as a rudder. The part of this turned to the wind has a similar air pocket arrangement to that of the main part of the balloon for keeping its shape. Although this addition effected a mitigation of the evil, it was found necessary to take some further precautions, and the end was finally attained by attaching to the back, where the oscillations are greatest, an auxiliary balloon. This is ring shaped, the diameter of the inner circular opening being ten centimeters, and is connected to the main balloon by a rope 50 meters long. The external diameter of the ring is ten-sevenths of the diameter of the main balloon. Below this ring there is yet an attachment corresponding to the tail of a kite. The lower surface of the annular balloon, i. e., the one exposed to the wind, is perfectly smooth. This auxiliary balloon appears near the ground in one of the cuts.

These two steering contrivances produce a perfectly satisfactory stability, such as is enjoyed only in an absolute calm when using the ordinary balloon. The kite balloon may be used in any wind, so long as the filling and the ascent are possible.

At Berlin the inhabitants often had opportunity to see the kite balloon ascend side by side with the spherical (pear-shaped) balloon, at the practicing grounds of the aeronautic division. It could clearly be seen that the kite balloon was still when its spherical companion was subject to considerable rolling. We are indebted to Prometheus for the above particulars. The engravings were prepared from illustrations sent us by a correspondent in Germany.



TESTS OF THE PARSEVAL BALLOON.

An Egyptian Crocodile Mummy.

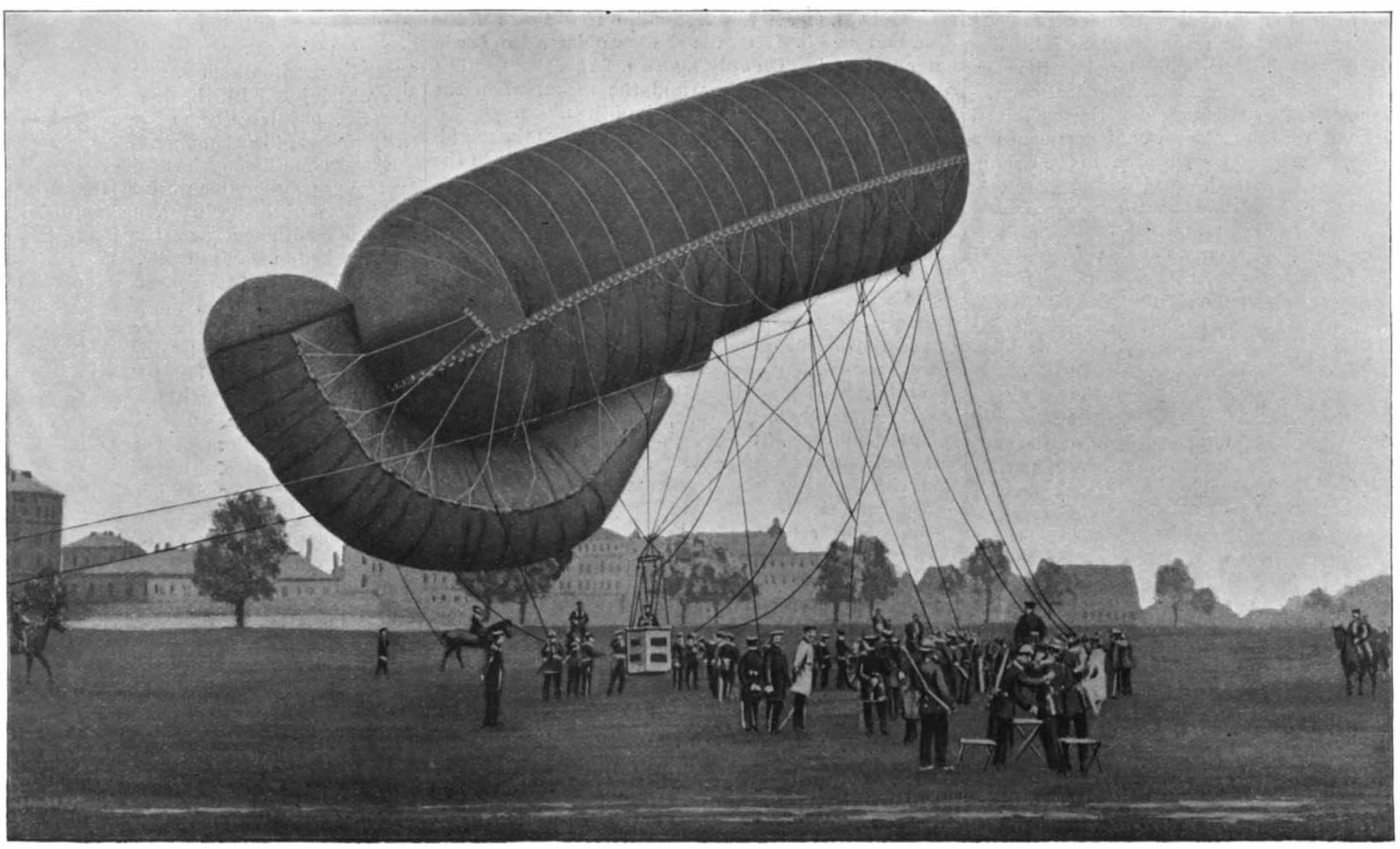
The varied and interesting collection of mummies, mummy cases and funereal furniture contained in the British Museum has recently been enriched by the acquisition of an enormous crocodile mummy, says Knowledge. This creature measures thirteen feet in length, and is well preserved, having a swarm of young crocodiles on its back. Dr. Pritchard, in his "Analysis of Egyptian Mythology," says: "The ancient Egyptians believed that the souls which emanated from the primitive source transmigrated through various bodies; nor was this change confined to emanations of a lower and secondary order. As the souls of men transmigrated through different shapes, so the higher order or spiritual agents could, as occasion required, assume any form they chose; and sometimes the gods appeared in the world under the disguise of bulls, lions, eagles or other creatures."

This accounts for the vast army of gods, representing so many species in the natural world, which abound in European museums. These were maintained in their day at great expense in sacred parks and lakes, and persons were appointed to nourish them with the greatest care; and when they died the same sacred rites were performed over their bodies and the same preparation was made for their interment as if they had been one of the highest functionaries of the state.

The famous fellow that has just been added to our national collection was discovered at Kom Ombos, in upper Egypt, a city where this creature was venerated as early as 2500 B. C., and where ruins still remain having paintings relating to the adoration of Sebek. At the south side of one temple the remains of a large pond have been found, which probably served to satisfy the amphibious instinct of this adorable monster. During the reign of Ptolemy Philadelphus, B. C. 330, the worship of the crocodile reached its highest point.

The method employed in making crocodile mummies seems to have varied with taste and means. While some are exquisitely bandaged, others (as in the case of our latest addition) were simply dipped in a solution of wax and pitch, which renders them perfectly hard, and by which the young progeny are securely fixed in the hollow parts of the back.

This is one of the finest specimens of a mummied crocodile that we have seen. It was presented to the British Museum by the Egyptian government.



THE PARSEVAL KITE BALLOON FOR USE IN THE GERMAN ARMY.

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THE LAST OF THE YUKIAHS.

BY ENOS BROWN.

At the time of the Spanish conquest of California the Indian population in the territory was known to have been very large. In Northern California alone it is estimated that over fifty thousand aborigines roamed in undisturbed security all over this fertile land. With the advent of the conquerors the Indians began to decline in numbers, owing to the cruel treatment of the Spaniards and the introduction of hitherto unknown diseases which were very fatal to them, so that when the State came into possession of the Americans, not one-half as many Indians remained in the country as existed a century before.

The destruction of the tribes progressed more rapidly even under American domination than under the Spaniards. The fatal vice of drink became more general among them and they succumbed to the new civilization. When the settlers of the country discovered how well the northern half of the State was adapted for stock raising, they appropriated the lands of the helpless Indians, and drove them back into regions less fertile. The Indians resented this hardship by killing the white man's cattle, and then vengeance, cruel, swift and strong, was visited upon the inferior race, and a war of extermination was waged. Thousands of Indians were cruelly massacred, and the war ended when there were no more to kill.

Sonoma County, one of the most fertile in the State, the present home of a most prosperous and thrifty people, carefully suppresses in its annals all mention of the early treatment of the Indians by its pioneer founders. Its groves were shambles where the Indians were tortured by fire and exterminated by the sword.

Certainly, no more worthless types of humanity ever existed than the California savages. They were only a step in advance of the Australian in intelligence and were not the equal of that lowest type of humanity in the ingenuity of their devices for trapping game. The original California Indian was an abject and bestial object. Neither male nor female was clothed, except in extreme weather, when their nakedness was protected in some degree by hides and skins. They ate the most repulsive reptiles, snakes, lizards and worms. Roasted grasshoppers were a delicacy only matched by a feast of tainted fish. They derived their name of "diggers" from the custom of digging into the ground for roots or game. Their sole object in living was to exist with as little trouble to themselves as possible, and they were so lazy that the laziest white who ever breathed was a monument of industry in comparison.

There still lives the remnant of this once numerous tribe at Hopland, Sonoma County, California. Only two or three hundred are left. There has been secured to them a tract of worthless land upon which they have settled, and where they make a feeble pretense of raising vegetables and fruit. They own a little stock and are called civilized.

The church, out of its large charity, has sent them a missionary who has taught them agriculture, and has labored unceasingly to improve their condition and morals. They have a school where the youth are taught the rudiments of education and instruction given them in the common utilitarian arts. The women make good seamstresses and fair cooks, and both sexes, when in the chapel, are exceedingly devout. Some of the more ambitious have frame houses, but many prefer homes after the picturesque style of their forefathers, formed of saplings curved at the top and covered with straw.

These people have some virtues: hospitality, for instance. The women make baskets which are sometimes artistic, being ornamented with different colored straw, woven in angular figures and with feathers from gayly colored birds. The federal government, whose wards these Indians are, is doing all in its power to protect them from their most dangerous enemy, rum, but with indifferent success.

Heavy penalties are laid upon the trader who supplies them, but an Indian will barter everything he has for a bottle of whisky, and generally finds some unscrupulous dealer to supply him.

To this cause, and to diseases incident to civilization, the decimation of this remnant of the old Gallionomeros or Yukiah Indians may be ascribed. Every year shows their number decreased, and a generation hence will find the last of the tribe awaiting his final call.

THE YUKIAH INDIANS OF CALIFORNIA.

TYPICAL HUT OF THE ABORIGINES OF CALIFORNIA.

The World's Biggest Pump.

In a letter from Houghton, Michigan, to the Chicago Record, the writer describes the Calumet and Hecla pump named the Michigan, which is a truly marvelous piece of mechanism. It can deliver 2,500,000 gallons of water every hour in the twenty-four without being crowded to its limit of capacity, and it will do the work with scarcely as much noise as is made by the operation of an old style sewing machine. Outside the doors of the great building which houses it no sound is heard from within, and, standing beside the monster, upon the brink of the pit connected with the lake from which the water is taken, almost the only sound heard is the noise of the suction, as with every stroke more than a thousand gallons are lifted.

Briefly, it is a triple expansion pumping engine with a capacity of 60,000,000 gallons, standing nearly fifty feet in height and requiring 1,500 horse power for its operation. It has been proved by actual tests that the nominal capacity can be easily maintained for an indefinite time without injury or strain, and that pushed to its full capacity the pump could handle approximately 75,000,000 gallons in twenty-four consecutive hours.

The duty of the pump is to furnish water for the great stamp mills of the Calumet and Hecla Company, which has twenty-two steam pumps in continuous operation, daily pulverizing 5,000 tons of conglomerate rock into sand so fine that it can be carried away by a stream of swiftly running water. The pump is housed in a special building near the shore of Torch Lake and below the mills, and it forces a steady stream of water to the upper portions of the mill, where innumerable small jets play upon the great slime tables and jigs. Here the specific gravity of the fine particles of copper contained in the rock separate the mineral from worthless sand, and the size and force of the streams of water are so nicely regulated as to wash away the sand and yet carry with it the minimum of copper.

A BRONZE bust of Maria Mitchell has been unveiled in the Observatory at Vassar College. It was cast by the Gorham Manufacturing Company, from a plaster bust made in 1877.

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RECENTLY PATENTED INVENTIONS.

Engineering.

THROWING ENGINES OFF DEAD CENTERS.—James B. Rauch and Thomas Kennedy, Galena, Kansas. An apparatus devised by these inventors consists of a pivotally supported jointed arm carrying a shoe at its outer end, the shoe departing from the pivotal center as the sections are straightened, and then binding against the wheel rim. The arm may be connected by a lever with a pitman or other operating mechanism, and when the engine is on the dead center the shoe is put in binding contact with the wheel rim by straightening the arm, the further movement of which then carries the wheel off the center, the contact being broken and the friction shoe freed from the wheel when the arm comes in contact with a stop. The shoe section of the arm is adjustable lengthwise for adaptation to different sizes of wheels.

PIPE BOILER.—Alexander M. Lemke and Rowland Weston, Saginaw, Mich. According to this improvement two lengthwise water drums, mounted on suitable legs, are connected at their ends by vertical water legs with two upper separating drums, the latter being connected by pipes with each other and with a central steam drum at the top. Coils of pipe are arranged between the sets of water legs at the sides, the upper ends of the coils discharging into diagonally opposite drums, and the lower runs of the coils are at a suitable distance above the grate to form a fire box, the rear end of which is also closed by a coil of pipe. The construction is designed to insure perfect circulation and the quick generation of dry steam.

MOTOR.—Sumter B. Battey, New York City. A fluid pressure and hydraulic motor, patented by this inventor, is designed to utilize the motive agent with the highest efficiency. A wheel has in its periphery conduits or buckets into which water under pressure is discharged from nozzles in a surrounding pipe to rotate the wheel. The surrounding pipe is connected with a vessel from which the water is forced out by a pressure pipe. From the motor casing the water flows to a tank within which is a vessel connected with the supply pipe for the motor, and a pressure pipe opening into the tank forces the water into the vessel, whereby the motor may be operated without waste or loss of water.

Electrical.

SECONDARY BATTERY PLATE.—William P. Patton, Jersey City, N. J. The rectangular body of this plate is hollow, but is intact at all its edges, and one or more thin metal partitions are held within the cavity of the plate by engagement at the edges, forming a light and strong plate with great surface for the formation of an active coating. The partitions are clamped at all the edges between two sections of a mould wherein the side walls and edges of the battery plate are cast into form from molten metal that passes through perforations in the partitions near their edges, whereby the cast sides of the battery plate are integrally joined. The construction affords great internal area for a battery plate of moderate dimensions, and when the active coating on the inner and exterior surfaces is formed by electrolysis a compact and powerful electric accumulator is thus afforded.

TELEPHONE TRANSMITTER.—Horace C. Alexander, Bonham, Texas. To transmit the greatest possible volume of sound without grating or rattling, the diaphragm and shell, according to this invention, are formed from one piece of metal, the diaphragm being secured to a block of insulating material to which is secured a carbon block attached to a metal plate. A vibrating nipple on the diaphragm extends into a cell formed in the carbon block, a granulated electrode surrounding the nipple in the cell, and a yielding material being placed between the inner end of the carbon block and the diaphragm.

LIGHTNING ARRESTER AND FUSE BLOCK.—Gustave X. Gast, New Orleans, La. An instrument having a multiple automatic fuse block, for automatically closing or restoring an electric circuit when broken by the fusion of the conducting wire by lightning or by a heavy current, has been devised by this inventor. The invention comprises more especially a shunt circuit of variable or graduated resistance through which the current is directed as a spring arm moves from one trip arm, when its fusible connection is broken, to the next, whose fusible connection is intact, so that a sudden shock is not thrown upon the second fusible connection, and it is enabled to resist and hold the spring arm.

ELECTRIC RAILWAY.—Henry M. Jones, Meriden, Conn. For electric roads where the current is carried in a conduit beneath the track rail, this inventor has devised a simple and inexpensive construction, with a light and strong device for normally closing the slot of the conduit and obviating danger of accident from contact with live wires. The conduit extends longitudinally between the rails, and has a slot normally closed by a tubular cable made of spirally wound wire adapted to open or stretch at points lifted from the slot, a device being carried by the car for raising the cable from the slot. The cable is supported in the conduit by flanges which also serve as tracks upon which travel the rollers of the cable lifter of the car.

Bicycles, Etc.

TIRE.—Charles H. Paschke, Chicago, Ill. The rim is of the usual construction, according to this invention, and is perforated by bolts connected by pairs of chains with an outer rim, the latter being made of a series of four or more wires spaced apart and transversely connected by cross bars to form a slightly oval tread, the cross bars being arranged near the connections of the chains with the outer wires. The end pieces for the wires are connected together by screw rods, by screwing up which the wires may be tightened according to the degree of elasticity desired.

CHANGEABLE GEAR.—Thomas S. Drummond, Punxsutawney, Pa. According to this invention, the drive shaft has a gear wheel at each end, the gear wheels at opposite sides of the wheel being of different sizes, and being encircled by runways adapted to receive balls, and each runway having openings for the passage of a gear wheel into and out of engagement with the balls, the gear wheel at either side of the wheel being brought into engagement by the movement of a lever. By this means the rider can quickly change from a high to a low gear, and vice versa, according to the nature of the road upon which he is traveling. The construction is designed to be simple and inexpensive, admitting of the gear being readily repaired in case of damage.

Mechanical.

HONING MACHINE.—Terence F. Curley, Brooklyn, N. Y. For sharpening the blades of razors and other tools, this inventor has devised a simple, easily operated machine which will hold the cutting edge of the blade in proper position to the grinding stone, drawing the blade over the stone and reversing its position automatically. The machine has a reciprocating carriage in which is journaled a blade holder adapted to be turned at the end of the stroke of the carriage to reverse the position of the blade. The operator can give a short stroke to the carriage, to avoid reversing the position of the tool, the latter being then moved forward and backward over the stone with one face only in engagement with the stone.

Miscellaneous.

NOZZLE.—Charles A. Snider, Columbus, Ga. To facilitate the discharge of a large or small stream of water, according to the condition of a fire, or to throw a full or half circle spray of water, this invention provides an easily manipulated nozzle which may be changed to graduate the outlet opening. The discharge pipe has a spherical end on which rotates a cap at an oblique angle to the middle line of the pipe, and having a series of graduated openings adapted to register with the mouth of the pipe.

POLE TIP.—Arthur F. M. Brooke, Calgary, Alberta, Canada. A pole tip designed to prevent a neck yoke from being accidentally discharged from the pole consists, according to this invention, of a hollow casing on the outer end of the pole, having an angular flange adapted to be engaged by the ring of the neck yoke, which prevents the latter from sliding further back on the pole. On the lower side of the tip is a slot where a catch or latch is pivoted, adapted to catch the ring and hold it from coming off.

SEAL FOR PACKAGES.—Lewis F. Musson, Winona, Minn. A plastic seal, according to this invention, has pieces or particles of paper fabric compressed therein, of predetermined design and delineations and in predetermined order, to be used in connection with a wax seal produced upon a letter or package, so that practically no two seals will be alike. For verifying the genuineness of the seal, it is provided that, while the wax is still warm, certain pieces of particles are removed from the sealing strip and sent to the purposed destination of the letter or package, that the receiver may compare them with the designs on the seal.

SIGN.—William N. Ley, Wilbur, Washington. This sign has slat sections connected by loops, the rocking of one of the slats reversing the entire series and presenting their rear faces to the front, while another movement restores the slats to their normal position. As the change takes place the effect is as if the uppermost slat turned moved along the line of slats to the bottom. The invention also provides for constantly rocking the uppermost slat by a motor, producing automatically the continued changes.

MATTRESS.—John Hoffman, New Ulm, Minn. A mattress designed to be inflated by air is provided by this invention, together with a covering which may be removed and cleaned without difficulty, the entire construction precluding the harboring of insects. An inflatable sack fits within a frame adapted to fit in a bedstead, the sack resting on webbing. The covering may be of ticking, with an open end closed by lacings. The construction is simple and inexpensive.

COOKING APPARATUS.—William E. Baxter, Frankfort, Ky. This is a portable apparatus for use in camping out, and is designed to be readily packed in small space. When set up the oven adjoins the stove, and the latter may be used for heating purposes alone or for cooking other than baking. The oven is adapted to receive several pans, which form part of the outfit. When folded for transportation, the parts may be secured by a lock and safely carried as freight or baggage.

STOVE.—Ernest C. Cole, Council Bluffs, Iowa. This stove has a top draught tube supported by a universal joint, to give it a swinging motion and prevent its being in the way in putting in fuel, or being clogged by the fuel, also enabling the draught to be pointed at any desired angle. The air supplied by this tube is heated in its downward flow, affording a hot blast to be thrown directly on the fire in a manner designed to afford a perfect combustion of the fuel.

GAME APPARATUS.—William P. Wetzler, Allegheny, Pa. According to this invention, a box has parallel partitions extending from opposite edges nearly across, while arched strips between pairs of partitions have holes in their central portions, the strips being of different colors corresponding with different colored marbles with which the game is played. The marbles are run back and forth over the strips, the object being to place the different marbles in the holes or depressions of the strips belonging to their several colors.

GAME APPARATUS.—Reinhold F. de Grain, Washington, D. C. In a suitable casing, according to this invention, is a series of disks carrying numbers or symbols and fixed to an easily revoluble spindle, the revolving mechanism rotating or stopping them all separately or together for the registering of the symbols with reading points. As the operator pushes a rod in one or the other direction it causes the shaft to turn until coming to a stop by gravity, when the characters show through sight openings, exhibiting the characters to three sides of the box. The characters are preferably ordinary dice spots.

FLUID PRESSURE REGULATOR.—Peter Albertine, Jr., Carlstadt, N. J. This is an improved gas regulator which admits of being coupled to various supply and service pipes. It consists of a casing having inlet and outlet, and an annular chamber for containing a liquid into which dips the lower edge of a float carrying a valve stem whose valve moves toward and from a seat in the casing, the seat being arranged between the inlet and outlet. A guide on the stem engages guideways in the casing, the guide receiving weights to increase or diminish the weight of the float.

FIRE ESCAPE.—Daniel Cronin, Mannington, West Va. A drum carrying a wire or rope adapted for attachment to a window has at its ends wheels for brake straps, and is journaled in a frame from which drops a hanger arm supporting a belt or seat strap. Brake straps are secured to an attached brake setting frame of novel construction, the handle bar of which is grasped by a person seated in the strap, whereby the brake may be applied with the desired force to regulate the speed of descent.

PURIFYING WATER BY EBULLITION.—Alfred Dervaux, Brussels, Belgium. An apparatus more especially devised to free water from carbonate of lime has been devised by this inventor, in which a descending column of water is heated to the boiling point by introducing steam at the bottom of the column and then subjecting the steam escaping to a spray or sheet of cold water, forming a vacuum above the column of water and at the same time heating the spray, whereby steam is drawn through the water by suction, and the water is thoroughly boiled and forcibly agitated.

HUNTING APPARATUS.—Benedict Ott, La Crosse, Wis. To facilitate forcing wolves, foxes, rabbits, etc., out of their subterranean holes or burrows, this inventor has patented a novel device, comprising a stiffly flexible cable, made of tubing or wire rope, and with a close or compact exterior, having a rotary pilot bulb at one end and a rotating crank at its other end, the bulb being hollow and having ventilating holes to receive cotton waste or other material saturated with some freely burning substance. The cable has sufficient rigidity to enable it to be forced into a burrow and be rotated by the crank, it being designed to force or smoke out the animal.

INSECT TRAP.—Edward G. Lewis, St. Louis, Mo. A superior fly trap is afforded by this invention, one which may be folded to occupy but little space, as it is made of cardboard or a paper blank to be set up in box form. The meeting edges are separately engaged and an integral top is orificed and is scored from the orifice toward the angles of the body, the orificed portion being depressed when the trap is set up. There is a light orifice and an insect inlet orifice, the two orifices being widely separated.

Designs.

SPOON.—Vincent P. Tommins, Hoboken, N. J. The bowl of this spoon has a representation of the Grant tomb at Riverside Park, on the handle is a flag and eagle, and its wider portion has a foliate wreath margin.

GAME BOARD.—James A. Bush, Port Gibson, Miss. This game board affords a puzzle, with endless inclosures or channels contracted or curved inward toward each other and merging into broad rounding ends, the inclosures communicating with each other at points out of registry.

SPOON HANDLE.—William A. Jameson, Niagara Falls, N. Y. The front and back face of this handle are of violin shaped outline, with scroll ornaments at the sides of the widest portions and beadlike ornaments at the sides of the narrow portion, extending from the bowl to the scroll.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co. for 10 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS, ETC.

DER SCHORNSTEINBAU. Von Gustav Lang. Mit über 120 Abbildungen im Text und 2 Tafeln. Hannover: Helwing'sche Verlags-Buchhandlung. 1896. Pp. 186.

To those who read German and are interested in the building of chimneys, Professor Lang's work on chimney building will be most useful, touching, as it does, upon the many problems of construction arising in that branch of chimney building.

STEAM HEATING DATA. By William J. Baldwin, Expert in Heating and Ventilation. Published by the Author, Nos. 106 and 108 Beekman Street, New York. Pp. 28. Price 50 cents.

THE BRAVEST OF THEM ALL. By J. Selwin Tait, author of "Who is the Man?" etc. New York: The Eskdale Press. Pp. 68. Price $1.

This little work may figure as a prolonged Æsop's fable. Rudyard Kipling, in his "Jungle Book," has made animals popular, and here we have a contribution in the same field of literature in an attractive form and one which will meet with a warm reception from many a young reader.

REAGENTS AND REACTIONS KNOWN BY THE NAMES OF THEIR AUTHORS. Based on the Original Collection by A. Schneider. Revised and Enlarged by Dr. Julius Altschul. Translated from the German by Richard Fischer. Milwaukee, Wis.: Pharmaceutical Review Publishing Company. 1897. Pp. 82. Price 50 cents.

This pamphlet is very attractive from its interesting subject and from its reasonable approach to completeness. In its pages we find many an old friend, such as Fehling's solution, Herapath's quinine tests, and many others which might be cited as examples of the author's work. It is not, however, restricted to reagents, for we find tests for zinc given and many others. It is published in pamphlet form, and we cannot imagine that any working chemist would be content to dispense with so useful and valuable a work.

CALIFORNIA GAME "MARKED DOWN." Scenic Mountain Woodland Coverts and Tide March Resorts for Game; Lakes and Streams for Trout, and the Generous Pacific for all Desirable Marine Contributions to Sporting Life. Illustrated. San Francisco, Cal.: Passenger Department, Southern Pacific Company. 1896. Pp. 64.

POCKET MANUAL OF READY REFERENCE. For the use of Copy Editors, Proof Readers, Compositors, Typewriters, Copyists, Telegraphers, Students of Law, Newspaper Reporters, etc. Containing a Complete Vocabulary for Double Words from Webster's International Dictionary; over Five Hundred Latin and French Words, Legal Phrases and Colloquial Expressions, with their Definitions; Alphabetical List of Contractions and Abbreviations commonly met with in Writing and Printing; Complete List of County Names in the United States arranged alphabetically by States; Declaration of Independence, with the Names of the Signers; Constitution of the United States, with Amendments and Dates of Ratification; together with a Collection of Miscellaneous Information Handy at all Times for Quick and Reliable Reference. Compiled and arranged by P. J. Haltigan. New York: Excelsior Publishing House. Pp. 160. Price 50 cents.

We have cited at length the somewhat full title page of this useful little work, which will answer instead of a review as showing what it contains. It is nicely bound and well indexed.

A SYSTEMATIC TREATISE ON ELECTRICAL MEASUREMENTS. By Herschel C. Parker. New York: Spon & Chamberlain, 12 Cortlandt Street. London: E. & F. N. Spon, Limited, 125 Strand. 1897. Pp. vi, 120. Price $1.

This work, quite careful in its construction and rather well carried out, is largely a reproduction of a series of articles which have appeared in an electrical monthly. To a certain extent it shows that the articles were of this origin, and the author apologizes for it on that basis. We hardly think it requires apology, and think it will be an acceptable addition to a practical man's electrical library.

A NEW DAIRY INDUSTRY. Preparation and Sale of Artificial Mothers' Milk, "Normal Infants' Milk." By James Fred. Sarg, Black Forest Farm, Kempsville, Va. Norfolk: W. T. Barron & Company, Printers. 1896. Pp. 162.

The new dairy industry may be defined to be the application of every precaution in the direction of cleanliness. This little work, devoted more especially to the providing of milk for the feeding of infants, is an excellent plea for cleanliness in the barn, and the author certainly seems, in his plea for small establishments, to lay an excellent ground for cleanliness.

THE RAILWAY BUILDER. A Handbook for Estimating the Cost of American Railway Construction and Equipment. By William Jasper Nicolls. Fifth edition, revised and enlarged. Philadelphia: J. B. Lippincott Company. London: 6 Henrietta Street, Covent Garden. 1897. Pp. 283. Price $2.

This little work, with an excellent index, really attempts to cover, in less than 300 small pages, the entire subject of building railways. The author evidently realizes that he has attempted rather a herculean task, but we believe that this book will be useful for practical railroad men, to give them assistance in estimating the probable cost of construction and equipment of railways. So many works of this kind are devoted to English construction that we are glad to see the American field invaded.

EASY LESSONS IN MECHANICAL DRAWING AND MACHINE DESIGN. By J. G. A. Meyer.

The fourth number of this excellent work on draughting room practice is now out. It holds good its first promise, and is largely illustrated with figures of the draughtsman's methods, with formulas worked out in a manner that is a reminder to the regular draughtsman and a teacher to the amateur. The work is to be finished in twenty-four parts, at 50 cents each, at which price we mail the parts as issued.

BUILDING EDITION OF THE SCIENTIFIC AMERICAN.

We take pleasure in informing our readers that the semi-annual volume of the Building Edition of the SCIENTIFIC AMERICAN is now on sale. It is tastefully bound in leatherette covers and is sent by mail on receipt of $2. It contains most charming half tone engravings of picturesque country houses, and the views are accompanied by floor plans, and interior views are also given. In addition to this most prominent feature of the Building Edition descriptions of large public buildings are given, as St. Luke's Hospital; the new Massachusetts State House with its superb library; the Library of Columbia University, and other architectural works. One of the most interesting engravings in the volume is Helicon Hall, Englewood, N. J., where boys are educated esthetically with the aid of music, flowers, and works of art. Each monthly number of the Building Edition has a finely executed plate in colors which forms the cover, consequently there are six such plates in the book. The present volume surpasses in interest any of its predecessors.

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The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, $4. Munn & Co., publishers, 361 Broadway, N. Y.

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HINTS TO CORRESPONDENTS.

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References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

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Minerals sent for examination should be distinctly marked or labeled.

(7168) E. T. asks: Why do you have to put in a magic lantern slide upside down to make it show right on the canvas? A. Because the rays cross in the lantern.

(7169) F. L. C. says: Please give me, through Notes and Queries, a recipe for a hard cement for bicycle tires. A. For bicycle tire cement, mix together two parts pitch and one part of gutta percha. Melt over a water bath and use hot.

(7170) E. Y. M. asks: 1. What is the best way of cutting down a 500 volt current for charging storage batteries where a meter is used? A. The best way of charging cells from a 500 volt circuit is to use the current in a motor dynamo built to give the current required, perhaps 10 amperes at 25 volts per cell. 2. Will a rheostat made of German silver wire consume any of the current? A. The rheostat affects current by its resistance, according to Ohm's law—current=volts divided by ohms. 3. How much and what size German silver wire should be used to reduce current to proper voltage for charging the storage cells? A. It is not economical nor feasible to reduce a 500 volt current for charging cells with a wire resistance of any kind. 4. Would iron wire do as well? A. Iron has about one-half the resistance of German silver, and, therefore, about twice as much, size for size, would be required for any resistance. 5. How many watts will be consumed in charging a 150 ampere hour cell? A. Two and one-half volts are required to charge a storage cell; hence 2·5×150=375 watt hours. 6. To what voltage should the current be reduced? A. 2·5 × the number of cells in series.

(7171) L. C. T. says: Please send me a recipe for removing freckles from the skin. One that is not injurious, if such a thing is possible. A. Under the empirical title of "Albadermine," a process of removing tan and the milder variety of freckles, a foreign surgeon has devised the following:

Solution A.

Potass. iodid	dr. ii.
Iodine pur	gr. vi.
Glycerine	dr. iii.
Infus. rosæ	oz. iv.

Dissolve the iodide of potassium in a small quantity of the infusion and a drachm of the glycerine; with this fluid moisten the iodine in a glass of water and rub it down, gradually adding more liquid until complete solution has been obtained; then stir in the remainder of the ingredients, and bottle the mixture.

Solution B.

Sodæ hyposulph. thiosulphate	oz. iss.
Aqua rosæ exot	pt. i.

Dissolve and filter.

With a small camel's hair pencil or piece of fine sponge apply a little of "Albadermine A" to the tanned or freckled surface, until a slight but tolerably uniform brownish yellow skin has been produced. At the expiration of fifteen or twenty minutes moisten a piece of cambric, lint or soft rag with "B," and lay it upon the affected part, removing, squeezing away the liquid, soaking it afresh, and again applying until the iodine stain has disappeared. Repeat the entire process thrice daily, but diminish the frequency of the application if tenderness be produced. In the course of three to four days to as many weeks the freckles will either have disappeared entirely or their intensity will be greatly diminished. "Summer freckles" yield very speedily to this treatment.

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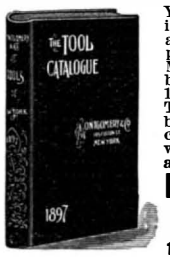

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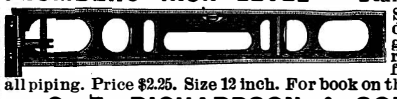
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AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

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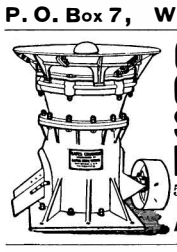
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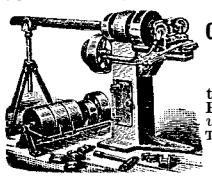

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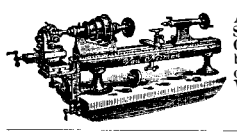

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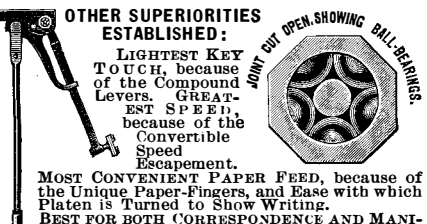

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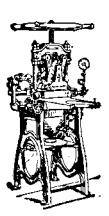

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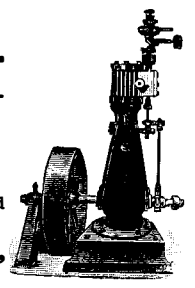

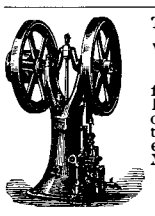

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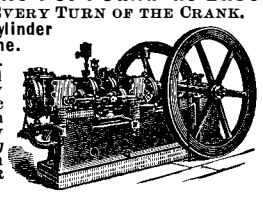

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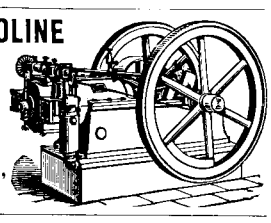

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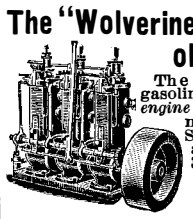

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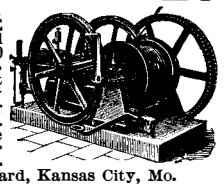

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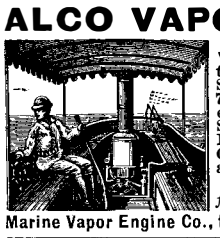

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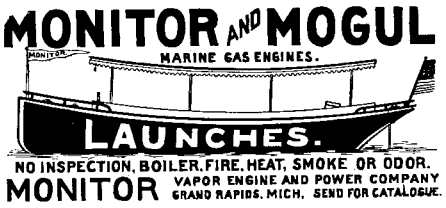

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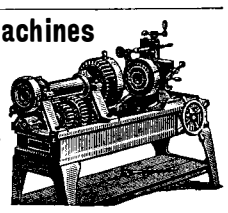

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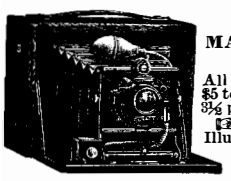

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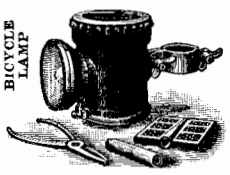

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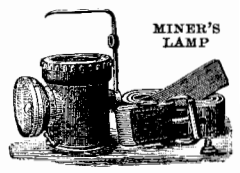

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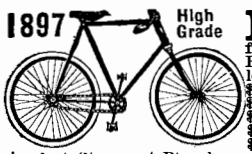

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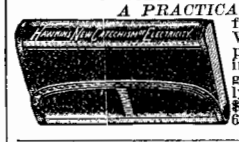

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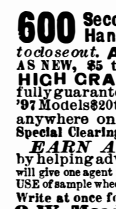

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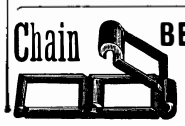

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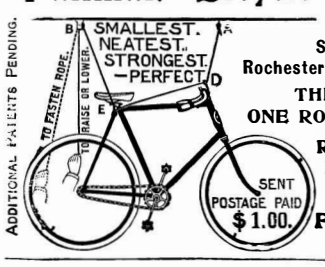

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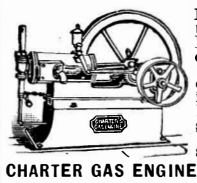

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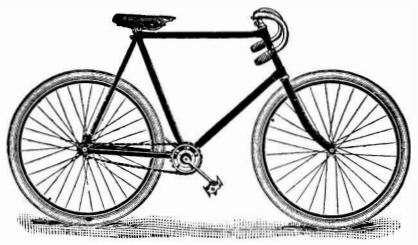

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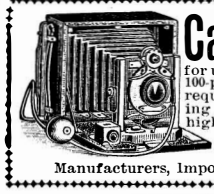

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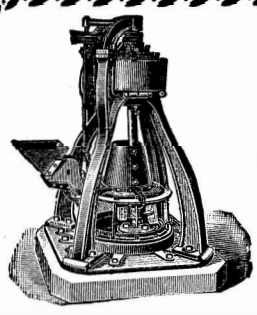

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